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NEW SPECIES AND NEW COMBINATIONS IN *ANREDERA* JUSS. (BASELLACEAE)

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ABSTRACT

Two new species of *Anredera*, ***A. aspera*** Sperling and ***A. densiflora*** Sperling, are described, and four new combinations, ***A. brachystachys*** (Moq.) Sperling, ***A. floribunda*** (Moq.) Sperling, ***A. krapovickasii*** (Villa) Sperling, and ***A. tucumanensis*** (Lillo & Hauman) Sperling, are made. These new species and new combinations are from the unpublished Ph.D. dissertation of Calvin R. Sperling.

KEY WORDS: *Anredera*, Basellaceae, taxonomy

FORWARD

[J. W. Nowicke, Botany Dept., NHB 166, Smithsonian Institution, Washington D.C. 20560 U.S.A.]

In the course of a palynological study that included *Anredera*, I discovered that two new species and four new combinations established by the late Calvin Sperling (1987) are heretofore unpublished. The Latin descriptions of the two new species, *Anredera densiflora* from Ecuador and Perú, and *A. aspera* from northern Bolivia, and the synonymy of the remaining four new combinations, *A. tucumanensis* (Lillo & Hauman) Sperling, *A. floribunda* (Moq.) Sperling, *A. krapovickasii* (Villa) Sperling, and *A. brachystachys* (Moq.) Sperling, have been taken from Spelling's dissertation. Before his death, he approved publication of these names.

Two more new combinations, *Anredera diffusa* (Moq.) Sperling and *A. marginata* (H.B.K.) Sperling, were recently published (Brako & Zarucchi 1993, p. 1253). In addition to the twelve species of *Anredera*, Sperling treated the remaining three genera that comprise Basellaceae, *Basella* L. (5 species), *Tournonia* Moq. (1 species), and *Ullucus* Caldas (1 species). Although his study concentrated on *Ullucus tuberosus* Caldas, Spelling's dissertation has keys, descriptions, distribution maps, and

[1] Deceased 20 May 1995.

discussions for the remaining eighteen species. His revision of Basellaceae as a family is the first since 1849, when it was treated by Moquin-Tandon. Spelling's discussions of relationships among genera and species provided new information that was integrated with the pollen data (Nowicke, in press). It is unfortunate that his dissertation has not been published in its entirety.

The species are taken up in the same sequence as they are in the dissertation. Abbreviations for authors follow Brummitt & Powell (1992).

Anredera Juss.

ANREDERA FLORIBUNDA (Moq.) Sperling, *comb. nov.* BASIONYM: *Boussingaultia floribunda* Moq. *in* DC., *Prodr.* 13(2):229. 1849. TYPE: COLOMBIA. Ibaque, *Goudot s.n.* (HOLOTYPE: P, F-fragment!; Photo: GH!).

ANREDERA DENSIFLORA Sperling, *spec. nov.* TYPE: PERU. Lima, San Buenaventura, 2700-2800 m, 17 June 1925, *Pennell 14508* (HOLOTYPE: F!; Isotypes: GH!, NY!).

Folia ovata vel depresso-ovata, 4.0-7.7 cm longa, 2.0-9.5 cm lata, base cordata vel reniformia, apice acuta (foliis ovatis) vel rotundata (foliis depresso-ovatis). Inflorescentia terminales aut laterales, fasciculato-racemosae, inflorescentibus axillaribus pedunculo plerumque robusto portatis. Bracteae subter pedicellum triangulares, 1.1-1.8 mm longae, 0.5-0.8 mm latae, persistentes; bracteae pedicellorum depresso-ovatae vel perdepresso-ovatae, 1.0-1.2 mm longae, 0.5-0.8 mm latae, persistentes. Sepala late ovata vel latissime ovata, alburnea vel alba, siccitate atrobrunnea. Petala obovata vel elliptica, 1.9-2.6 mm long, 1.0-1.3 mm lata, alburnea vel alba, siccitate atrobrunnea, petaliis interioribus tribus tenuioribus quam petaliis exterioribus duobus, fructu ad maturitatem includentibus. Ovarium globosum; stylus singularis, 0.8-1.2 mm longus; stigma obscure trilobatum.

Distribution. Southern Ecuador to southern Perú. 2100-2800 (3900) m.

ADDITIONAL SPECIMENS EXAMINED. ECUADOR. Azuay: Between Molleturo and Toreador, 2590-3900 m, 14 June 1943, *Steyermark 53002* (NY). Loja: Loja, 2200 m, 15 April 1946, *Espinosa 137* (NY).

PERU. Lambayeque: Prov. Lambayeque, Abra de Porculla, 45 km E of Olmos on the road to Pucara, 1920 m, 13 July 1986, *Plowman et al. 14290* (F). Cajamarca: Prov. Cajabamba, Nunubabamba[?], 2600 m, 13 Aug. 1985, *Mostacero & Guerra 0059* (F). Huanuco: San Rafael, 8500 ft., 4 April 1923, *Macbride 3143* (F); Acomayo, 2100 m, 24 April 1946, *Woytkowski 34245* (F,G,MO,UC,USM). Junin: Paucartambo, 2800 m, 23 July 1969, *Woytkowski 6719* (GH,MO).

Anredera densiflora can be recognized by the dense inflorescence and flowers in which the sepals and outer two petals spread in fruit. It is similar to *A. baselloides* Baill. but differs by the ovate leaves, flared petiole, dense inflorescence, smaller flowers, broader sepals, and trilobed stigma (not divided). This species lacks

mammillose cells at the sepal base but does form a very low keel due to contraction of the sepal during drying as in *A. baselloides.*

ANREDERA TUCUMANENSIS (Lillo & Hauman) Sperling, *comb. nov.* BASIONYM: *Boussingaultia tucumanensis* Lillo & Hauman, Anales Mus. Nac. Buenos Aires 33:353. 1925. (Hauman & Irigoyen, Anales Mus. Nac. Buenos Aires 32:159, 449. 1923, *nom. nud.*). LECTOTYPE (here chosen): BOLIVIA: Prov. of Larecaja, Sorata, between Cochipata and Milipaya along the Ulcumarini River, 3200 m, March-May 1858, *Mandon 1028* (LECTOTYPE: K!; Isolectotypes: BM!, F!, G!, GH!, K!, NY!, P; Photos: F!, GH!, MO! of G). SYNTYPE: ARGENTINA: Prov. of Tucuman, Sierra de Garabatal, 2000 m, 22 March 1922, *Schreiter s.n.* (LIL).

ANREDERA KRAPOVICKASII (Villa) Sperling, *comb. nov.* BASIONYM: *Boussingaultia krapovickasii* Villa, Lilloa 32:305, fig. p. 306. 1966. TYPE: ARGENTINA: Salta, km 28, road between Salta and Jujuy, 31 Jan. 1947, *C.A. O'Donell 4723* (HOLOTYPE: LIL).

ANREDERA BRACHYSTACHYS (Moq.) Sperling, *comb. nov.* BASIONYM: *Tandonia brachystachys* Moq. *in* DC., *Prodr.* 13(2):227. 1849. LECTOTYPE (here chosen): COLOMBIA. Bogota, *Goudot 1* (P-Herb. Moq., det. by Moq.; Photo: GH!). SYNTYPE: ECUADOR. west side of Pichincha, 8500 ft., [without collector] (K!, P-fragment ex. Herb. Hook.; photo GH!).

ANREDERA ASPERA Sperling, *spec. nov.* TYPE: BOLIVIA. Prov. La Paz, Dept. Larecaja, Sorata, 68° 40′ W 15° 45′ S, 2530 m, 8 Dec. 1981, *Sperling & King 5412* (HOLOTYPE: GH!; Isotype: LPB!, others not distributed).

Planta scandens vix volubilis succulenta mucliaginaque. Caules rubelli asperi praesertim ad nodos. Folia obovata, 2.1-4.2 cm longae, 1.4-2.0 cm latae, base cuneata vel acuta, apice obtusa vel rotundata. Inflorescentia laterales racemosae simplices aut base unifurcatae, pedicellis minutis, 0.5-0.7 mm longis. Bracteae subter pedicellum deltatae, 0.9-1.0 mm longae?, 0.8 mm latae?, adnatae decursivaeque; bracteae pedicellorum rhombicae vel perdepresse trullatae, 0.7-0.9 mm longae?, 0.8-1.0 mm latae, apice acutae, base truncatae, lobis lateralibus sagittiformibus, adnatae decursivaeque. Sepala perdepresse-ovata, 2.0-2.4 mm longa, 2.3-2.4 mm lata, apice acuta, viridulo-alba, erecta et per anthesin patentia. Petala obovata, 3 mm longa, 1.5-1.6 mm lata, alba, erecta et per anthesin urceolata. Ovarium globosum vel obovoideum; stylus singularis, 1 mm longus, super basin ad stigma expansus; stigma obscure trilobatum capitatum. Fructus adhuc ignoti.

Distribution. Known only from the type collection in northern Bolivia.

Anredera aspera can readily be distinguished by its asperous stem and greatly flared style. The flowers are nearly sessile but upon close inspection the very short pedicel is evident. The flowers are erect at anthesis and not spreading like many species of *Anredera*. The pedicellar bracts are decurrent down the pedicel and continuous with it, forming a cuplet on which the flower is borne.

This species is similar to *Anredera marginata*, from which it differs in having always obovate leaves (even in the flowering portion of the stem), nearly sessile flowers that are slightly larger than *A. marginata*, and flared styles.

Unlike most species of *Anredera* this plant is scarcely twining, a character which is constant when the plant is cultivated in the greenhouse. In the greenhouse it is more difficult to propagate, being much slower in forming adventitious roots from cuttings than any other species of *Anredera*.

The species was collected growing alongside *Anredera ramosa* (Moq.) Eliasson and in the same general area where the type specimen of *A. tucumanensis* was collected by Mandon. The type collection was observed being visited by flies, which are the presumed pollinators.

One collection from Bolivia may be this species: BOLIVIA. near La Paz, 10,000 ft., Oct. 1885, *Rusby 2570* (NY two sheets, F). It has a similar pedicel and pedicellar bracts, but the leaves are lacking. Fruits are present in this specimen (enclosed in the nigrescent perianth); because the type collection lacks fruits a comparison can not be made. The petals of the Rusby collection are slightly smaller, and most of the flowers on the sheets are in poor condition.

ACKNOWLEDGMENTS

I thank David Lellinger for editing the two Latin descriptions and reviewing the paper, and Dan Nicolson for his review and suggestions.

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STEVIA CALZADANA (ASTERACEAE) A NEW SPECIES FROM OAXACA, MEXICO

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ABSTRACT

Stevia calzadana B.L. Turner, *spec. nov.*, is described and illustrated from Oaxaca, (Mpio. Coicoyan de las Flores), México. It belongs to the series *Corymbosae* of *Stevia* where it relates to *S. jorullensis*, distinguished from the latter by its linear-lanceolate, glandular-punctate leaves and achenes with aristate pappus scales.

KEY WORDS: Asteraceae, Eupatorieae, systematics, *Stevia*, México

Routine identification of Mexican composites (Asteraceae) has revealed the following novelty.

STEVIA CALZADANA B.L. Turner, *spec. nov.* Figure 1. TYPE: MEXICO. Oaxaca: Mpio. Coicoyan de las Flores, Distr. Santiago Juxtlahuaca, El Arenal, 4 km de Coicoyan de las Flores, carretera a San Martin Peras - Santiago Juxtlahuaca (17° 17′ N × 98° 15′ W), 1775-1890 m, 20 Nov 1994, *J.I. Calzada 19539* (HOLOTYPE: TEX).

S. jorullensis H.B.K. similis sed foliis linearibus-oblanceolatis (vs. ovatis), glanduliferis-punctatis (vs. non glanduliferis-punctatis); et pappis acheniorum aristatis (vs. coroniformibis).

Fig. 1 *Stevia calzadana*, from holotype.

Stiffly erect, mostly unbranched, perennial herbs ca. 1 m high. Stems reddish, vestiture puberulent with minute upcurved hairs ca. 0.2 mm high. Leaves opposite throughout, gradually reduced upwards; petioles 1-3 mm long. Midstem leaves linear-oblanceolate, 5.0-6.5 cm long, 5-6 mm wide, glabrous throughout, abundantly glandular-punctate, especially beneath, 1-nervate or weakly 3-nervate, the margins entire. Heads arranged in both terminal and axillary, mostly congested, flat-topped cymules 4-10 cm across, the ultimate peduncles mostly 1-5 mm long. Involucres cylindric, 5-6 mm long, the bracts sparsely puberulent to nearly glabrate, their apices acute. Corollas (dried) deep rose-colored, 6-9 mm long, the tube and throat indistinct, glabrous or nearly so, the lobes 1-2 mm long, glabrous without. Achenes with body 3.0-3.5 mm long, minutely hispidulous, the pappus of 3 linear artistate scales ca. 5 mm long, the upper portion barbellate for 1-2 mm, below these a crown of 3 or more united scales ca. 0.5 mm high.

This species is distinguished by its linear-oblanceolote leaves which are essentially glabrous, and 3-aristate achenes. In Grashoff's unpublished doctoral thesis (Univ. of Texas, Austin, 1972) the species will key to or near *Stevia jorullensis* H.B.K., but it differs from the latter in both leaf shape (linear-oblanceolate vs. ovate) texture (densely glandular-punctate beneath vs. not so), and pappus aristate (vs. coroniform, without aristae).

It is a pleasure to name this distinctive *Stevia* for J.I. Calzada, extraordinary collector of Mexican plants, now associated with UNAM on the flora of the Mixteca Alta region of Oaxaca.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and Piero Delprete and Mark Mayfield for reviewing the manuscript. The illustration was drawn by Ms. Maria Thompson.

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MENODORA GYPSOPHILA (OLEACEAE), A NEW SPECIES FROM NEAR GALEANA, NUEVO LEON, MEXICO.

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ABSTRACT

A new species, ***Menodora gypsophila*** B.L. Turner, is described from gypseous soils near Galeana, Nuevo León, México. It is closely related to the widespread *M. coulteri* but differs by a number of characters, including leaf-shape, venation, vestiture, and substrate preference.

KEY WORDS: Oleaceae, *Menodora*, systematics, México

Routine identification of plants from northeastern México has revealed the following novelty.

MENODORA GYPSOPHILA B.L. Turner, *spec. nov.* TYPE: MEXICO. Nuevo León: Mpio. Galeana, Santa Rosa, arid hillside, 1610 m, 6 Oct 1995, *Hinton et al. 25643* (HOLOTYPE: TEX).

M. coulteri A. Gray similis differt foliis crassis, pro parte maxima triplinerviis et apiculatis, et caulibus moderate pubescentibus et hirsutis, pilis 0.2-0.3 mm longis (vs. pilis deorsum curvatis et 0.1-0.2 mm longis).

Low much-branched shrublets 10-20 cm high. Stems terete, moderately pubescent with widely spreading hairs mostly 0.2-0.3 mm long. Leaves opposite throughout, gradually reduced upwards, those at midstem lanceolate-elliptic, markedly thickened, bearing 3 raised nerves on the lower surface, pubescent like the stem, entire, the apices apiculate, the blades mostly 5-15 mm long, 4-6 mm wide. Flowers terminal, the pedicels reflexed in fruit. Calices 3-6 mm long; lobes 8-13, 2-4 mm long, linear-lanceolate, pubescent with spreading hairs. Corollas bright yellow; tubes 2-4 mm long; lobes 5-10 mm long, 3-6 mm wide. Anthers yellow, exserted 2-4 mm from the tube. Style exserted 3-5 mm from the tube. Paired capsules ovoid, reflexed, each ca. 5 mm across; seeds obovoid, ca. 4 mm long, 2 mm across, the outer surface spongy and irregularly patterned.

ADDITIONAL COLLECTIONS EXAMINED: MEXICO. Nuevo León: Mpio. Galeana, 5 km from Galeana, along the road to Rayones, 1600 m, 27 Jun 1994,

Hinton et al. 24474 (TEX); 3 km N of Galeana on rather bare gypseous-calcareous (?) soils, 26 Jul 1993, *Turner 93-158* (TEX).

Collections of this species were unknown to me at the time of my treatment of *Menodora* for North America (Phytologia 71:340-356. 1991.). As indicated by the specimens cited above, this taxon was first collected by myself in 1993 (along with several close-up photographs). The two subsequent collections were made by Jaime and George Hinton in about the same area, apparently also in gypseous soils. I have selected *Hinton 25643* as the type of this species because the collections concerned possess relatively large well-developed leaves and bountiful flowers. The other two collections are not as lush and possess leaves about half the size of the type, with decidedly smaller flowers, especially *Turner 93-158* which has very small calyces (3-4 mm long) with only ca. 8 lobes (vs. ca. 13 in the type). In most other details, however, the paratypes are like those of the holotype. When originally collected I thought that *M. gypsophila* might be an aberrant specimen of *M. coulteri*, the latter having thinner, largely enervate leaves and a finer, down-curved stem-pubescence. The additional Hinton collections have convinced me that the populations concerned deserve a name. I am especially grateful to George Hinton's perceptive eye who sent me the most recent collection with the observation (pers. letter) that "the leaves have clear venations that are unlike any in our collections, and I couldn't match it to any in your revision of the genus", which is so, hence the description here.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to Piero Delprete and Mark Mayfield for reviewing the paper.

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A NEW COMBINATION IN *PHYSALIS* (SOLANACEAE)

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ABSTRACT

Margaranthus solanaceous is transferred to the genus *Physalis* and hence the monotypic genus *Margaranthus* becomes a synonym of *Physalis*.

KEY WORDS: *Physalis, Margaranthus*, Solanaceae, systematics

Margaranthus Schldl. (Solanaceae) is a monotypic genus from México and the southwestern United States. It was described by Schlechtendal 1838. It has always been regarded as very closely related to the genus *Physalis* L., differing in form and colour of the corolla and insertion of filaments. The annual *M. solanaceous* Schlechtendal has an urceolate, violet/greenish corolla with adnate filaments while in *Physalis* the corollas are campanulate to nearly rotate, yellow or whitish and the filaments are free.

In his monograph, Rydberg (1896) considered *Margaranthus* as very closely related to *Physalis* but kept it as a separate genus. In a karyological report, Menzel (1950) noted the great similarities between *Margaranthus* and *Physalis* and, based on S/T ratio data placed *Margaranthus* between the annual sections *Angulatae* and *Pubescentes* of *Physalis*. She did not, however, make any formal transference. Waterfall (1958) in his survey of *Physalis* in North America commented on the similarity of *Margaranthus* to *Physalis* and noted that if not in flower, *Margaranthus* could not be distinguished from small-fruited species of *Physalis*. He stated that possibly *Margaranthus* should be included in *Physalis*, but that further studies including critical species of *Chamaesaracha* (*C. grandiflora* (Hook.) Fern., *C. nana* (A. Gray) A. Gray, both now in *Leucophysalis*) were needed before formal transference. He thus kept *Margaranthus* as it was originally described, as a genus of its own. On the other hand he included *Quincula lobata*, another related, monotypic genus in *Physalis*, even though *Quincula* differs from *Physalis* in several characters besides colour of corolla. This was probably due to *Quincula* originally being described as a *Physalis*.

My recent cladistic analyses of the physaloid group, including among others *Margaranthus, Quincula, Chamaesaracha,* and *Leucophysalis* (Axelius 1995) has

shown that *Margaranthus* is well nested within the *Physalis* clade (including *P. pubescens* L., *P. angulata* L., and *P. peruviana* L.), close to *P. pubescens* (Axelius 1995, fig. 1). The species of *Chamaesaracha, Quincula,* and *Leucophysalis* are more distantly related and found clearly outside the *Physalis* clade. The species of *Chamaesaracha* group together and form a very strongly supported sister-relation with *Quincula.* There is thus a rather strong support for the hypothesis that *Margaranthus* has originated from an ancestor within the core *Physalis.* This view is also in accordance with analysis based on molecular data (Martínez 1993). Hence *Margaranthus* cannot be kept separated from *Physalis* without splitting the core of this genus into smaller monophyletic entities. *Physalis* is a large genus which lacks a modern revision and it's circumscription might be questioned in many ways but to keep *Margaranthus* separated under these circumstances, can not longer be justified.

PHYSALIS SOLANACEOUS (Schlechtendal) Axelius, *comb. nov.* BASIONYM: *Margaranthus solanaceous* Schlechtendal, Index Sem. Hort. Hal. 1838 Coll. 8. 1838. TYPE: Cult. in Horto Botanico Halensis 1838, "e seminis in Mexico locis calidioribus coll. C. Ehrenberg". *D.F.L. Schlechtendal s.n.* (HOLOTYPE: HAL).

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TAXONOMIC OVERVIEW OF *HEDYOTIS NIGRICANS* (RUBIACEAE) AND CLOSELY ALLIED TAXA

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ABSTRACT

A taxonomic study of *Hedyotis nigricans* is rendered in which a widespread var. *nigricans* is recognized, along with five regional or localized, allopatric varieties: var. *floridana* (southern Florida); var. *pulvinata* (northeastern Florida); var. ***austrotexana*** B.L. Turner, var. nov. (southern Texas); var. ***gypsophila*** B.L. Turner, var. nov. (montane regions of Nuevo León, México and closely adjacent states); and var. ***papillacea*** B.L. Turner, var. nov. (northern panhandle and trans-Pecos, Texas, and closely adjacent New Mexico). A key to these taxa is provided along with maps showing their distributions. Additionally, these taxa are compared with the closely related species *H. angulata* and *H. butterwickiae*, and maps showing their distribution are also provided.

KEY WORDS: Rubiaceae, *Hedyotis*, *Houstonia*, systematics, Mexico, Texas

Hedyotis nigricans (Lam.) Fosberg (=*Houstonia nigricans* [Lam.] Fern.) has been variously treated as belonging to the genus *Hedyotis* or *Houstonia* (Shinners 1949; Terrell 1986, 1991), some workers preferring an inclusive *Hedyotis* (including *Houstonia*), others preferring a more restricted *Hedyotis* (excluding *Houstonia*, cf. Terrell 1991). Most current workers accept *Hedyotis nigricans* as belonging to *Hedyotis*, including Terrell (1991), albeit tentatively. Terrell (1986) provided a taxonomic overview of *H. nigricans* for the U.S.A., especially Florida, but did not treat in detail collections from Texas, New Mexico, and México.

The present contribution is based upon the detailed examination of over 800 sheets of *Hedyotis nigricans* on file at LL, TEX, and SRSC.

Key to Texas populations of *Hedyotis nigricans* and closely related taxa

1. Leaves mostly basal, very numerous and forming pulvinate mats, the stiffly erect rather naked stems having markedly appressed, stiff-lanceolate leaves; fruits mostly orbicular; southeastern most Brewster Co. .... *H. butterwickiae*

1. Leaves otherwise, mostly cauline and spreading; fruits mostly ovoid (except for Gulf Coastal populations); widespread..(2)
   2. Midstem leaves thick and short, ovate-linear to lanceolate, 1 cm long or less, the margins never enrolled; capsules orbicular at maturity; calyx lobes 1 mm long or less; rock or cliff-dwelling species of eastern trans-Pecos, Texas and closely adjacent México.......................................*H. angulata* Fosberg
   2. Midstem leaves not as described in the above, the margins to some extent enrolling with dessication; capsules ovoid at maturity; calyx lobes mostly 1 mm or more long, if shorter then the leaves decidedly linear to linear-oblanceolate; mostly not rock or bare-bluff species, widespread (*H. nigricans*). ....(3)
3. Calyx, and/or upper stems and leaves to some extent papillose with extended epidermal cells, these superficially resembling hairs, or else the calyx to some extent beset with callose hair-like enations..(4)
3. Calyx, upper stems and leaves glabrous or merely ciliate along the leaf margins and calyx lobes...var. *nigricans*
   4. Plants mostly sprawling, low bushy herbs 5-15 cm high; panhandle and trans-Pecos Texas..var. *papillacea*
   4. Plants mostly simple-stemmed, non bushy herbs 20-40 cm high; southern Texas...var. *austrotexana*

Key to Mexican populations of *Hedyotis nigricans*

1. Primary leaves at midstem mostly 1-3 mm wide, 3-12 times as long as wide; calyx usually glabrous, or with but a few ciliate hairs; mostly calcareous soils, widespread...var. *nigricans*
1. Primary leaves at midstem mostly 3-6 mm wide, 2.5-3.5 times as long as wide; calyx usually markedly setose with thickened hairs; mostly gypseous soils of southernmost Coahuila, Nuevo León, and very closely adjacent Zacatecas and probably Tamaulipas. ....var. *gypsophila*

HEDYOTIS BUTTERWICKIAE (Terrell) Nesom, Syst. Bot. 13:434. 1988.
Houstonia butterwickiae Terrell

This species, first described by Terrell in 1979, was retained by both Nesom (1988) and Terrell (1991). It is known only by collections from along the ridgetop of the Bullis Range on the Bullis Gap Ranch, in Brewster Co., which is about 20 mi S of Sanderson (Terrell Co.). The taxon is obviously closely related to *Hedyotis nigricans* but can be immediately recognized by its very narrow, linear-lanceolate, relatively thickened stiffly ascending stem leaves, the basal leaves forming a dense pulvinate array of shorter, somewhat broader elliptic-lanceolate leaves. Additionally, Terrell, in his original description, notes that the taxon has nearly globose capsules and a relatively diffuse inflorescence.

HEDYOTIS NIGRICANS (Lam.) Fosberg, Lloydia 4:287. 1941.

Terrell (1986) treated this taxon as belonging to the genus *Houstonia* but subsequently (1991) positioned it in *Hedyotis*. He considered *H. nigricans* to be a "polymorphic species", but nevertheless recognized three varieties in the complex, a

widespread highly variable var. *nigricans*, and two very localized varieties in Florida, both coastal (Figure 1).

I have examined numerous sheets of this species from over a broad region and recognize three additional varietal taxa, as described below. All of these are largely allopatric with var. *nigricans* but appear to intergrade into the latter in regions of near contact.

Even with the removal of these several newly described elements, var. *nigricans* remains quite variable, ranging from rather spindly plants with linear to linear-oblanceolate leaves in eastern and central Texas, to shorter plants with linear-lanceolate to linear-elliptic leaves in west-central Texas and westwards. In México the variety, while quite variable, is less complex, as shown in Figure 2.

HEDYOTIS NIGRICANS var. *NIGRICANS*

Terrell (1986, 1991) accounted for most of the Texas names involved in the synonymy of this variety, and these are briefly touched upon here.

Houstonia salina A.A. Heller -This name is typified by material from coastal areas of southern Texas (Nueces Co.). I agree with Terrell (1986) that the plants concerned differ but little from typical elements of var. *nigricans*.

Houstonia tenuis Small -This name is typified by material from central Texas (San Saba Co.) and appears to be the same as var. *nigricans*, as noted by Terrell (1991).

Houstonia angustifolia Michx. var. *rigidiuscula* A Gray, Syn. Fl. N. Amer. 1(2):27. 1884. Shinners (1949) transferred this variety into *Hedyotis nigricans* without comment, merely noting it to be typified by plants collected in "S. and W. Texas, Palmer, Havard, & c. Coast of E. Florida, Rugel. (Mex)". Unfortunately, to my knowledge, no one has lectotypified the name concerned, but my own evaluations of this apellation are that it was meant to apply to plants having a low rigid stature, mainly occurring in the southwestern U.S.A. (western Texas, New Mexico, and Arizona) and México. Those who might wish to apply this varietal name to such plants over this region might do so, but I view the variation between such habital forms as relatively trivial, there being gradual intergradation between such populational forms over a broad region of central Texas and northern México. In short, there seems little merit in attempting to define what the habital limits of var. *rigidiuscula* might be.

Houstonia angustifolia Michx. var. *scabra* S. Wats., Proc. Amer. Acad. Arts 18:97. 1883. (TYPE: MEXICO. Coahuila: Carocol Mts, 19-20 Aug 1880, *E. Palmer 410*; Isotype: LL!). -This name is unaccounted for by Terrell (1986, 1991) but examination of type material shows this to belong to var. *nigricans*. The Carocol Mts are said to be located about 24 mi southeast of Monclova, México (McVaugh 1956), an area well within the distribution of var. *nigricans* as defined in the present treatment.

HEDYOTIS NIGRICANS (Lam.) Fosberg var. ***AUSTROTEXANA*** B.L. Turner, ***var. nov.*** TYPE: U.S.A. Texas: Karnes Co., roadside 2 mi E of El Tejano Cafe, "dry sandy, clay soil", 22 Jun 1952, *Joe C. Johnson 833* (LL).

H. nigricans (Lam.) Fosberg var. ***austrotexana*** B.L. Turner, *var. nov.*; similis *H. nigricans* var. *nigricans* sed calyces maturi valde papillosi ubique.

Resembling var. *nigricans* but the mature calyces markedly papillose throughout.

Other than having markedly papillose calyces, this taxon is essentially the same as var. *nigricans*; indeed, it apparently replaces the latter in the region shown in Figure 1. The two varieties do, however, grow in close proximity and occasional plants appear to show intergradation of the calyx character concerned in regions of near contact (*e.g.* Goliad Co.: *Smith 4271*; San Patricio Co.: *Turner 80-91M*).

HEDYOTIS NIGRICANS (Lam.) Fosberg var. ***GYPSOPHILA*** B.L. Turner, ***var. nov.*** TYPE: MEXICO. Nuevo León: Santa Rita, 2370 m, "Sparse pine woods - gypsum hillsides," 11 Jun 1981, *Hinton et al. 18278* (HOLOTYPE: TEX).

H. nigricans (Lam.) Fosberg var. ***gypsophila*** B.L. Turner, *var. nov.*; similis *H. nigricans* var. *nigricans* sed plantae parviores et ramosissimi e basi; folia ovato-elliptica et saepius 2.5-3.5 plo longiores quam latiores (vice folia linearia-lanceolata usque linearia-oblanceolata et saepius 4-20 plo longiora quam latiora); calyces maturi plerumque hispidi enatis capillaribus et latis basi (vice calyces glabros enatis infirme evolutis).

Resembling var. *nigricans* but the plants low and much-branched from the base, the leaves elliptic-ovate and mostly 2.5-3.5(4.0) times as long as wide (vs. linear-lanceolate to linear-oblanceolate, mostly 4-20 times as long as wide) and the mature calyces usually markedly hispid with broad-based hairs (vs. glabrous or merely minutely setose).

This taxon is represented by 45 or more collections at LL, TEX, mostly obtained from gypseous soils in the state of Nuevo León. While quite variable as concerns calyx pubescence, the branching habit and leaf shape is very diagnostic, and in combination the characters are as distinctive for recognition purposes as those characters in combination used by, for example, Terrell in his recognition of *Hedyotis nigricans* var. *pulvinata* (Small) Fosb., the latter superficially resembling var. *gypsophila* as conceived here.

HEDYOTIS NIGRICANS (Lam.) Fosberg var. ***PAPILLACEA*** B.L. Turner, *var. nov.* TYPE: U.S.A. New Mexico: Otero Co., northern McKittrick Canyon at first crossing of Texas-New Mexico boundary on the New Mexico side, "gravels and boulders of stream bottom. In Riparian type habitat and below protected cliffs; Big tooth maple, Ponderosa Pine, Madrone", etc. 8 Oct 1973, *Thomas F. Patterson 508* (HOLOTYPE: LL).

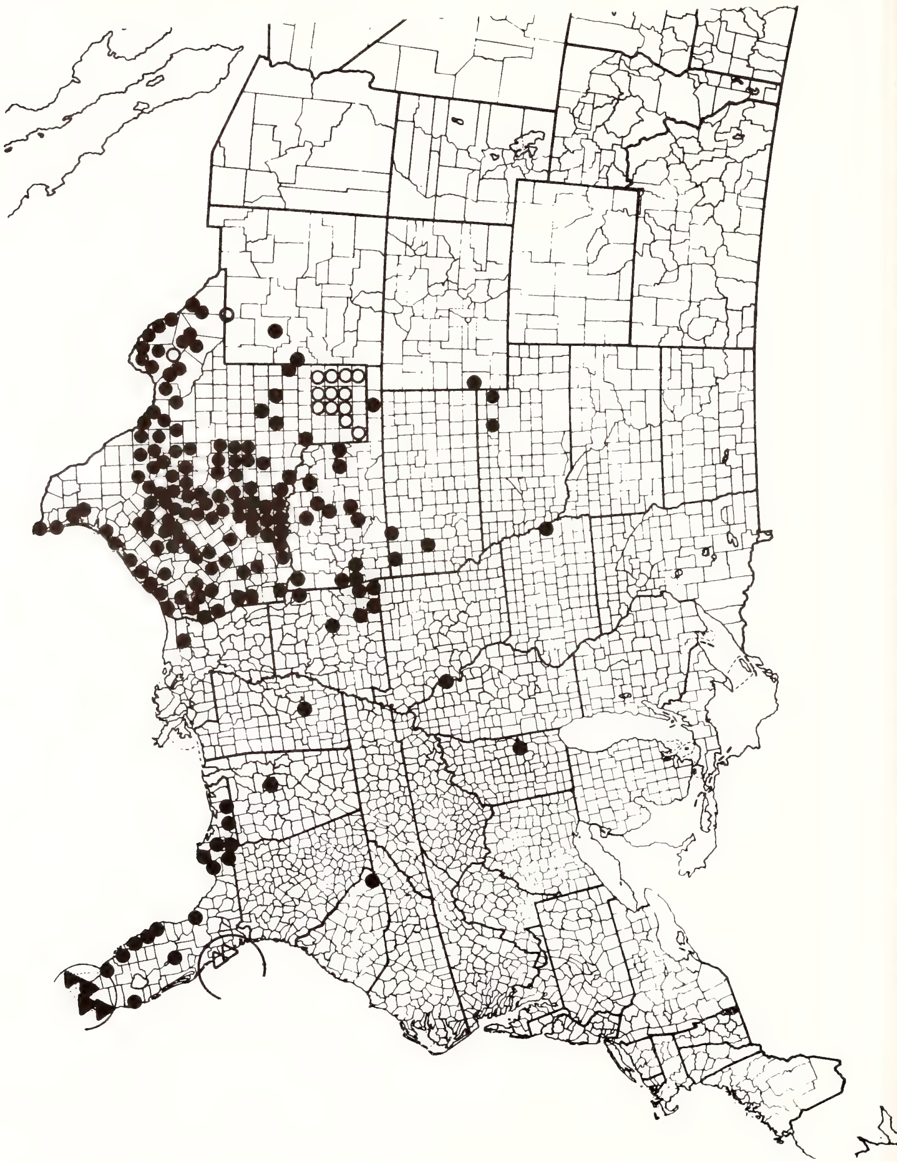

Figure 1. Distribution of *Hedyotis nigricans* in U.S.A.: var. *nigricans* (closed circles); var. *austrotexana* (diagonals); var. *floridana* (closed triangles); var. *papillacea* (open circles); var. *pulvinata* (open triangles).

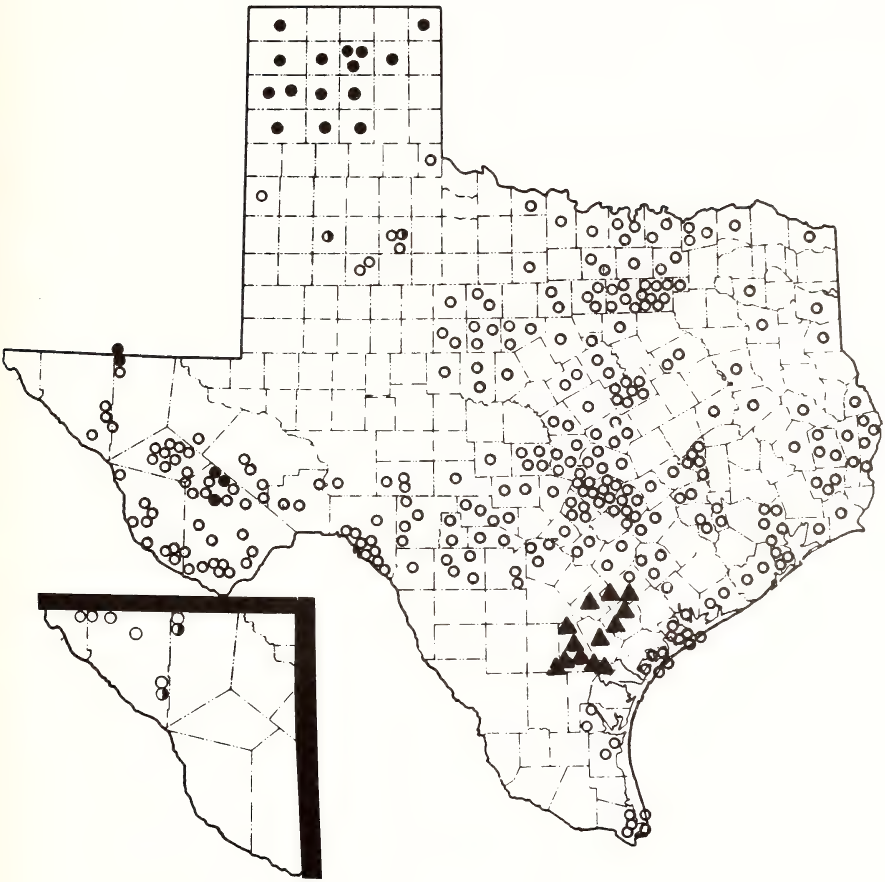

Figure 2. Distribution of *Hedyotis nigricans* complex in Texas: var. *nigricans* (open circles); var. *papillacea* (closed circles); ± intermediates to var. *nigricans* and var. *papillacea* (half circles); var. *austrotexana* (triangles).

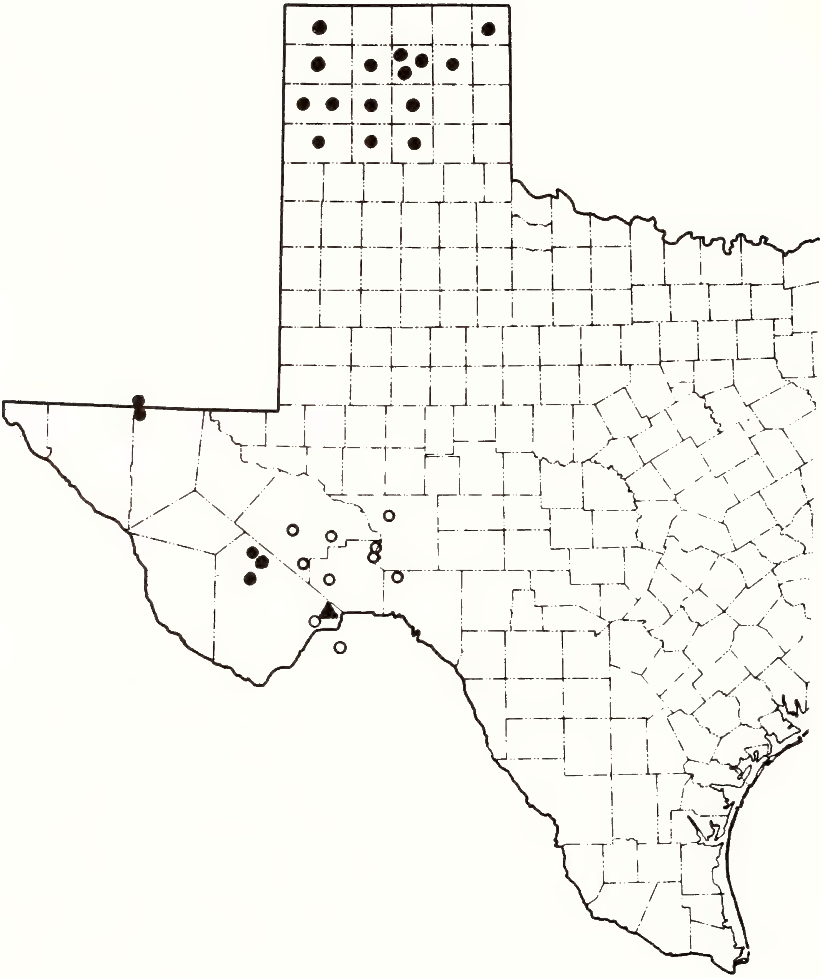

Figure 3. Distribution of *Hedyotis angulata* (open circles) and the superficially similar *H. nigricans* var. *papillacea* (closed circles); *H. butterwickiae* (triangle).

Figure 4. Distribution of *Hedyotis nigricans* in México: var. *nigricans* (open circles); var. *gypsophila* (closed circles); intermediates (half circles).

H. nigricans (Lam.) Fosberg var. ***papillacea*** B.L. Turner, ***var. nov.***; similis *H. nigricans* var. *nigricans* sed saepius 5-15 cm alta, enascens caudicibus ramosis et ligneis; caules, folia, calycesque aliquantum papillosi enatis capillaribus.

Resembling var. *nigricans* but the plants mostly 5-15 cm high and the stems, leaves and calyces to some extent papillose with hair-like enations.

As shown in Figure 1, the var. *papillacea* is largely confined to the northernmost panhandle region of Texas where it passes, rather abruptly, into var. *nigricans*. It also is found in the trans-Pecos regions of Texas and closely adjacent New Mexico where it reportedly occurs in and along limestone ledges and bluffs (Del Norte, Glass and Guadalupe Mts). Plants of the latter region superficially resemble *Hedyotis angulata*, and some of these were annotated as such by Terrell (e.g., *Warnock 7978*, from the Del Norte Mts [TEX]). Inclusion of the panhandle collections with the trans-Pecos material might appear moot in that the panhandle collections have somewhat longer, more linear-lanceolate leaves and occur as populational disjuncts. However, similar populational disjunctions occur in several species of Asteraceae (e.g., *Chrysothamnus*) and need not be cause for much concern, at least I find it difficult to distinguish between the two populational elements.

It should be noted that the type collection of var. *papillacea* was found growing with or near material that might be deemed to be var. *nigricans* (*Patterson 508, 516*) in that these two relatively late-flowering collections seemingly lack the papillose enations which characterize the taxon, but in all other characters these two plants resemble var. *papillacea* as conceived here. The same is true for occasional specimens from the panhandle region, where the variety is apparently much more common, to judge from herbarium collections.

Finally, it should be emphasized that from among the 1000 or more specimens of var. *nigricans* examined by me in the present study, only a few sheets were discerned to have papillose enations of the type found in var. *papillacea*, at least two of these from the state of Florida (Franklin Co., sand dunes and coastal areas along the Gulf of Mexico: *Henderson 63-1309*; *Kral 39899*). Obviously such enations are under relatively simple genetic control, but in the var. *papillacea* these appear to be populationally "fixed" in the regions shown in Figure 1, occurring on plants with a habital display quite different from the habital display of var. *nigricans* over most of its eastern distribution.

ACKNOWLEDGMENTS

I am grateful to my wife, Gayle, for the Latin diagnoses, and to her and Piero Delprete for reviewing the manuscript.

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THE STATUS OF *QUERCUS ARKANSANA* SARG. (FAGACEAE) IN TEXAS

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ABSTRACT

The status of *Quercus arkansana* Sarg. in Texas is discussed. It is known to occur in Cass County, and there is an historical record for Jasper County.

KEY WORDS: *Quercus arkansana*, Texas, Fagaceae, phytogeography

Quercus arkansana Sarg., an uncommon Coastal Plain oak with scattered populations ranging from southwestern Georgia and northwestern Florida to southwestern Arkansas and northwestern Louisiana, has not been known for Texas (Bill Carr, Texas Natural Heritage Program, pers. comm.; Correll & Johnston 1970; Johnston 1990; Stanley D. Jones, Botanical Research Center (BRCH), pers. comm.; Hunt 1986; Little 1977; Nixon 1985; Sargent 1965; Simpson 1988; Vines 1977). Hunt (1990) lists the species as occurring in Texas on the basis of an historical specimen collected in 1903 in Jasper County (*W.W. Ashe 1* [NCU]). More recently, two small populations of *Q. arkansana* have been found in Cass County.

In 1990, Hunt (*Hunt TX218* [to be distributed to TEX and ND]) first confirmed *Quercus arkansana* from Texas, identifying it as "*Q. arkansana* tending toward *Q. nigra*." This collection, representing one sapling, was from the south side of TX 77, 1 km west of the Louisiana state line in sandy loam pine-oak woods dominated by *Pinus echinata* P. Mill., *Quercus falcata* Michx., *Q. nigra* L., and *Liquidambar styraciflua* L. This find was the result of searches stimulated by the presence of a large population in Louisiana about 3 km away, documented initially by G.H. Ware (*Ware 1492* [DAV]) in 1965 (Hunt 1990).

In 1995, the MacRobertses found several small trees (up to 7 meters high) in a young, densely stocked, even-aged pine plantation on deep sandy soils along a 1 km

stretch of Cass County Road 4561 about 5 km northeast of McLeod, Texas, and 5 km west of Rodessa, Louisiana, which they identified as *Quercus arkansana* (*MacRoberts & MacRoberts 2875* [NCSC], *2874*, *2877* [BRCH], *2879* [VDB], *2881* [LSUS], *2873* [ND], *2878* [DAV]). Some of these specimens were sent elsewhere for confirmation. Hunt determined *2876* as "probably *Quercus arkansana* × *Q. nigra*;" *2875* and *2873* were identified as *Q. arkansana* by J.W. Hardin and Richard Jensen, respectively. Julia Larke determined an unnumbered specimen to be *Q. arkansana*. This population is within 2 km of a large population of *Q. arkansana* in Louisiana centering on a point where Black Bayou and State Line Creek cross LA 168 about 3 km west of Rodessa (Teague & Wendt 1994). Associated species for this site include *Quercus marilandica* Muenchh., *Q. stellata* Wang., *Q. incana* Bartr., *Pinus taeda* L., *P. echinata*, *Vitis* spp., *Sassafras albidum* (Nutt.) Nees, and *Liquidambar styraciflua*. The area was heavily shaded, had a dense pine litter and almost no herbaceous understory, and was badly damaged by commercial forestry.

The environment of the Cass County sites is typical for the species: midslope of eroding sandhills adjacent to headwater tributaries. That *Quercus arkansana* occurs in Cass County is not surprising since it occurs in adjacent parishes and counties in Louisiana and Arkansas (Hunt 1990; Louisiana Natural Heritage 1995; Smith 1988). Hunt (1986) has documented increased introgression between *Q. arkansana* and *Q. nigra* at the range edge of the former. Thus the mixed traits found in the Cass County collections are expected: short petioles (*Q. nigra*), scurfy leaf and twig pubescence (*Q. arkansana*), and leaf shape varying between the two provide strong evidence for putative hybridization between these species.

In addition to these recent finds, Hunt located a specimen from Jasper County (*W.W. Ashe 1* [NCU]) collected in 1903 that is probably *Quercus arkansana* but may be a hybrid between *Q. nigra* and *Q. velutina* Lam. (Hunt 1990). This specimen was originally identified as *Q. velutina* × *Q. laurifolia* Michx. Unfortunately, a specific locality is not given and, although much potential mesic sandhill habitat exists in the northern third of the county, relocating this population, if it still exists, may be difficult. The east Texas landscape has been drastically altered over the past century, and *Q. arkansana* is notorious for its patchy distribution and its inconspicuousness, which has always made it difficult to locate (Hunt 1986).

These populations represent westward range extensions for *Quercus arkansana*. Additional populations of this oak are expected and should be sought in Bowie, Marion, and Cass counties. The rarity of this species in Texas and throughout its range makes it a good candidate for any protected plant list for the state, and an effort to protect its habitat should be made to ensure its survival in Texas.

ACKNOWLEDGMENTS

Stanley Jones (BRCH) and Bill Carr (Texas Natural Heritage Program) supplied information on the distribution of *Quercus arkansana*. J.W. Hardin (NCSC), Richard Jensen (ND), and Julia Larke (Louisiana Natural Heritage Program), confirmed the MacRobertses' initial identification. Hunt's research was supported by NSF Grant BSR-8414419 to David E. Giannasi and David M. Hunt. Thanks are due to Lori

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CHROMOSOME NUMBERS REPORT

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ABSTRACT

A first record of *Muhlenbergia quadridentata* chromosome number is given, a diploid chromosome number for *M. virescens* is reported for the first time, and the tetraploid condition of *M. montana* is confirmed.

RESUMEN

Se registra por primera vez el número cromosómico de *Muhlenbergia quadridentata*, un número cromosómico diploide para *M. virescens* se reporta por primera vez, y la condición tetraploide de *M. montana* se confirma.

KEY WORDS: *Muhlenbergia*, Poaceae, cytology

INTRODUCTION

The mostly American genus *Muhlenbergia* Schreber is comprised by two rather distinct groups which had been cytologically studied by several authors. Pohl (1964) studied the broad-leaved, mesic, rhizomatous species from the deciduous forests of eastern North America. While Peterson (1988), did chromosome counts for the group of annuals comprising the xeromorphic caespitose species, distributed in the western plains of America. They both reached the conclusion that the basic number for the genus is $x = 10$.

Chromosome counts were completed during a systematic study of the *Muhlenbergia montana* (Nutt.) Hitch. complex (Herrera-A. & Bain 1991; Herrera-Arrieta & Grant 1993, 1994), a group of thirteen perennial, xeromorphic caespitose species. Chromosome counts for three species of the complex were successful and are here reported. Chromosome number for *M. quadridentata* (H.B.K.) Kunth is a first report, the *M. virescens* (H.B.K.) Kunth chromosome count seems to be the first

diploid record of the aneuploid number reported by Reeder (1967), and the *M. montana* tetraploid condition reported by Reeder (1968) is confirmed.

MATERIAL AND METHODS

Chromosome determinations are based on observations of up to twelve cells from a minimum of five individuals per population, using a phase contrast microscope. Floral buds were field collected in 95 percent ethanol-glacial acetic acid (3:1) prior to fixation and storage under refrigeration in 70% ethanol. To stain: Hydrolyze in 1N HCl at 60°C for 7 to 10 minutes, and stain in Feulgen reagent for 2 hours, rinsed in running tap water for 3 minutes. Slides were prepared in a drop of 45% acetic acid, and squashing the floral buds under a cover slip. The cover slip was temporarily sealed with a paraffin-gum arabic mixture. Attempts to grow the plants from this species complex under greenhouse conditions failed, and therefore no mitotic counts were possible.

RESULTS

POACEAE:

Muhlenbergia quadridentata (H.B.K.) Kunth, $n = 10$. MEXICO. México: 2 km W of Río Frio, North exposition of Volcán Iztaccihuatl, 3100 m, *Pinus-Quercus* forest, *Herrera & Cortés 919* (CIIDIR,MTMG).

Muhlenbergia virescens (H.B.K.) Kunth, $n = 10$. MEXICO. Chihuahua: 25.6 miles S of Creel on road to Batopilas, 2100 m, table rock with *Arctostaphylos*, *Pinus* and *Quercus* spp., *Herrera* with *Peterson & Annable 969* (*CIIDIR,MTMG*).

Muhlenbergia montana (Nutt.) Hitchc., $n = 20$. MEXICO. México: Entrance to the National Park "Lagunas de Zempoala", 2960 m, forest of *Pinus hartwegii* and *Abies religiosa*, *Herrera & Cortés 926* (CIIDIR,MTMG).

All of them showing stable microsporocytes with normal bivalents during meiosis.

Recorded chromosome numbers from Reeder (1967, 1968) are: *Muhlenbergia virescens* $2n = 24$ and *M. montana* $2n = 40$.

DISCUSSION

The basic chromosome number recognized for *Muhlenbergia* is settled as $x = 10$ (Pohl 1964; Reeder 1967, 1968; Peterson 1988). Diploidy ($n = 10$) and tetraploidy ($n = 20$) are the most common in this genus, however one case of octaploidy was reported by Pohl (1964) for *M. californica* Abrams, a rare endemic species.

Chromosome counts remain necessary to support the interpretation of evolution in this genus. One of the important findings here is that the more widely distributed species of the complex (*Muhlenbergia montana*) is a tetraploid, while the other two

species from more restricted geographic areas (*M. quadridentata* and *M. virescens*), are diploids. All this seems to support the theory of evolution of grasses (Stebbins 1956).

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A NEW COMBINATION IN *MUHLENBERGIA* (POACEAE)

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ABSTRACT

Systematic analyses of morphological and anatomical variation among populations of *Muhlenbergia villiflora* and *M. villosa* indicate that there is insufficient differentiation to warrant recognition of these taxa as separate species. The new combination of ***M. villiflora*** var. ***villosa*** is proposed as a more appropriate means of recognizing the habitat preference and slight differences in spikelet size that distinguish these taxa. Nomenclatural data and a key to the varieties are provided.

KEY WORDS: *Muhlenbergia*, Poaceae, systematics

Species of the *Muhlenbergia repens* Hitchc. complex are distributed throughout North America (excluding the southeastern United States), and in the Andean highlands of South America. This complex consists of eight species characterized by a rhizomatous perennial habit with short culms seldom exceeding 20 cm, short involute leaf blades, and a short contracted panicle with awnless or mucronate spikelets. Two species, *M. villiflora* Hitchc. and *M. villosa* Swallen, differ from the others by having a densely villous lemma and palea. These species appear distinct from each other in that *M. villosa* is slightly larger in all morphological attributes including plant height, leaf size, inflorescence length, and spikelet length. Their distribution and habitat requirements are also distinct; *M. villiflora* is an ecological dominant in gypsum soils of northern México, and *M. villosa* is locally sporadic to common in alkaline or calcareous soils of west Texas and New Mexico.

Morphological and anatomical analyses of these two species (Morden 1985; Morden & Hatch 1987) have shown that specific recognition of both taxa is not warranted. Anatomically, these taxa are indistinguishable (Morden & Hatch 1987), and plants of *Muhlenbergia villiflora* found growing along the margins of their natural habitats (*i.e.*, soils with a more abundant water supply or lower concentration of gypsum) are larger, and approach *M. villosa* in most characteristics. Therefore, these species are herein treated as a single species, *M. villiflora*, and the two forms are recognized as varieties, var. *villiflora* and var. *villosa* (Swallen) Morden based on their

habitat preferences and morphological differences. A key to the varieties and complete descriptions are provided below.

Spikelets usually less than 2.0 mm long; plants of gypsiferous soils of northern México. ....1. *M. villiflora* var. *villiflora*
Spikelets usually greater than 2.0 mm long; plants of alkaline or calcareous soils, west Texas and New Mexico. ....2. *M. villiflora* var. *villosa*

1. *Muhlenbergia villiflora* Hitchc. var. *villiflora*, North Amer. Fl. 17:470. 1935.-- *Vilfa pubescens* Fourn., *Mex. Pl.* 2:102. 1886. TYPE: MEXICO. Cañon de las Miñas et Victoria, inter Michibuana et Tanquecillos, *Karwinsky 1012* (HOLOTYPE: P; Type fragment: US!). Not *Muhlenbergia pubescens* (H.B.K.) Hitchc. (North Amer. Fl. 17:460. 1935.).

Perennial with scaly rhizomes; the scales 3-18 mm long, acute, often deteriorating with age. Culms much-branched above, wiry, erect, seldom spreading, 7-17 cm tall (rarely higher), 0.3-0.7 mm diam., glabrous; internodes 5-33 mm long, nodulose-roughened at least below the inflorescence. Sheaths 3-16 mm long, usually about 1/2 the length of the internode, margins hyaline and clasping at the base, open and diverging from culm near the leaf collar. Ligules membranous, 0.3-1.5 mm long, erose, toothed, or acute, decurrent. Blades 3-19 mm long, 0.2-1.0 mm wide, abaxial surface glabrous, adaxial surface pubescent, strongly involute and arcuate spreading, margins scabrous, prominent midvein absent. Inflorescence a contracted panicle, 1-4 cm long (occasionally longer), 1-15 mm wide or wider if branches open or reflexed, usually exserted above the upper leaf sheath; inflorescence branches solitary at each node, with 4-11 nodes per inflorescence; branches ascending. Pedicels 0.1-1.1 mm long, minutely setose. Spikelets 1.4-2.3 mm long, not crowded on the branches, 1-15 spikelets on the lowermost panicle branch. Glumes equal, 0.6-1.7 mm long, acute, 1/2-2/3 the length of the floret, 1 (occasionally 2-or 3-) -nerved, green or purple. Lemmas acute, 1.3-2.3 mm long, 3-nerved, densely villous near the base and along midnerve and margins to near the apex, green or becoming purple at maturity; mucro absent to 0.6 mm long. Paleas 1.0-2.1 mm long, densely villous between the nerves, with color similar to lemma. Anthers 0.7-1.6 mm long, yellow, dark green, or purple. Caryopses narrowly elliptic to linear, 0.7-1.2 mm long, 0.2-0.3 mm wide, dark brown. Chromosome number $2n = 20, 22$ (Reeder 1967).

Distribution. México: Chihuahua, Coahuila, Hidalgo, Nuevo León, San Luis Potosí, and Zacatecas. Open ground in gypsiferous to calcareous soils, often forming extensive stands across gypsum flats.

2. ***MUHLENBERGIA VILLIFLORA*** Hitchc. var. ***VILLOSA*** (Swallen) Morden, *stat. nov.*-- BASIONYM: *Muhlenbergia villosa* Swallen, J. Wash. Acad. Sci. 31:350. f. 2 1941. TYPE: UNITED STATES. Texas: 15 miles south of Stanton, 11 July 1928, *Tharp 5048* (HOLOTYPE: US!; Isotypes: GH!,MO!,TEX!).

Perennial with scaly rhizomes; the scales 5-16 mm long, acute, often deteriorating with age. Culms much-branched above, wiry, erect, seldom spreading, 4-30 cm tall, 0.3-0.7 mm diam., glabrous; internodes 5-37 mm long, nodulose-roughened at least below the inflorescence. Sheaths 5-15 mm long, usually about 1/2 the length of the internode, margins hyaline and clasping at the base, open and diverging from culm

near the leaf collar. Ligules membranous, 0.4-1.5 mm long, erose, toothed, or acute, decurrent. Blades 7-30 mm long, 0.2-1.2 mm broad, abaxial surface glabrous, adaxial surface pubescent, strongly involute and arcuate spreading, margins scabrous, prominent midvein absent. Inflorescence a contracted panicle, 1-5 cm long, 1-5 mm wide, usually exserted above the upper leaf sheaths; inflorescence branches solitary at each node, with 5-11 nodes per inflorescence; branches ascending. Pedicels 0.1-1.2 mm long, minutely setose. Spikelets 1.8-2.5 mm long, not crowded on the branches, with 2-9 spikelets on the lowermost panicle branch. Glumes equal, 0.6-1.8 mm long, acute, 1/2-2/3 the length of the floret, 1 (rarely 2) -nerved, green or purple. Lemmas acute, 1.8-2.4 mm long, 3-nerved, densely villous near the base and along the midnerve and margins to near the apex, green or becoming purple with maturity; mucro absent to 0.4 mm long. Paleas 1.7-2.3 mm long, densely villous between the nerves, color similar to the lemma. Anthers 0.9-1.4 mm long, yellow, dark green or purple. Caryopses narrowly elliptic to linear, 1.0-1.4 mm long, 0.2-0.4 mm wide, dark brown. Chromosome number $2n = 20, 40$ (Morden 1985; Reeder 1967).

Distribution. United States: southern New Mexico and Texas in the Trans-Pecos, western Edwards Plateau and southern High Plains. Open ground in alkaline to calcareous soils, usually in isolated clumps and seldom forming dense stands.

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Phytologia (July 1995) 79(1):31-34.

SEDUM BOOLEANUM (CRASSULACEAE), A NEW RED-FLOWERED SPECIES FROM NUEVO LEON, MEXICO

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ABSTRACT

A new species of *Sedum*, ***S. booleanum*** B.L. Turner, is described from Nuevo León, México where it occurs in gypsum outcrops. The taxon is red-flowered and has the habit of *Villadia* but the petals are separate to the base, or nearly so, suggesting a position in *Sedum* where it apparently has no close relatives. A photograph of living material is also presented, along with a photograph of its namesake.

KEY WORDS: Crassulaceae, *Sedum*, systematics, México, Nuevo León

Routine identification of Mexican plants has revealed the following novelty, which was called to my attention by the collectors concerned.

SEDUM BOOLEANUM B.L. Turner, *spec. nov.* TYPE: MEXICO. Nuevo León: Mpio. Rayones, Cerro Blanco, 1340 m, gypsum hillsides, forming colonies, 27 Feb 1990, *Hinton et al. 20468* (HOLOTYPE: TEX!).

Succulenta erecta, perennis, radicibus fibris, 5-8 cm alta. Caules 3-4 cm diametro prope basim (ubi siccati) et papillosi. Folia (siccata) ovata, papillosa, 7-10 mm longa, 3-4 mm lata, gradtim deminuta ab imo caulis (ubi mox decidua) ad apicem per 1/2-2/3 suas longitudines superposita ut caulem celent. Flores 5-10, terminaliter dispositae in ramis brevibus circinatisque, inflorescentiam congestam, 1-2 cm latam, circa 1 cm altam facientes. Sepala 5, ovata, glabra, circa 3 mm longa, 1.5 mm lata, latissima prope medium, libra vel paene libra ad basim, costis dorsalibus prominentibus. Stamena 5, alternata, petalis circa 3 mm longis, antheris luteis in plantis maturis. Carpella 5, 2-5 mm alta per anthesin, stylis erectis, circa 1 mm longis. Fructus maturi non visi.

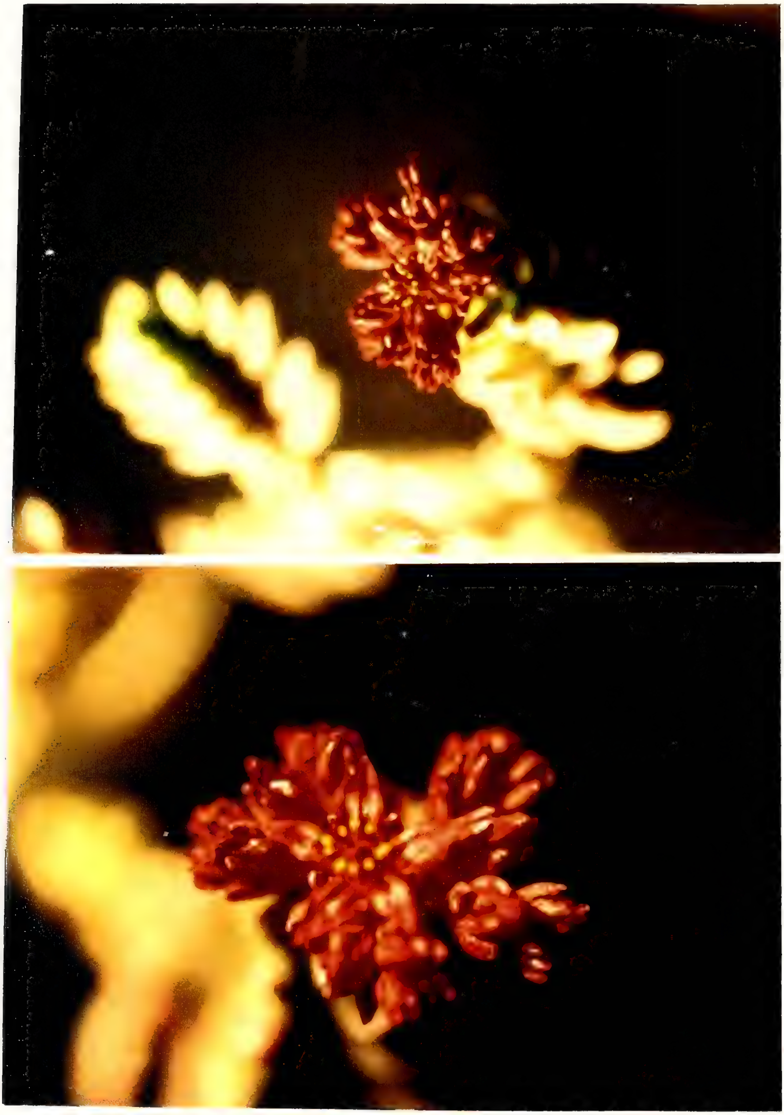

Figure 1. *Sedum booleanum*, photograph of type material.

Figure 2. George Boole Hinton, in the field on Rancho Aguililla, Nuevo León, México, at the type locality of *Paronychia hintoniorum* (cf. p. 38 this issue).

Erect fibrous-rooted perennial (?) succulent 5-8 cm high. Stems near base 3-4 mm across (when dried), papillose. Leaves (dried) ovate, papillose, 7-10 mm long, 3-4 mm wide, gradually reduced from the bottom of the stem (where soon deciduous) upwards, overlapping for 1/2-2/3 their lengths so as to obscure the stem. Flowers 5-10, arranged terminal on short circinnate branches, forming a congested inflorescence 1-2 cm wide, ca. 1 cm high. Sepals 5, ovate, glabrous, ca. 3 mm long, 1.5 mm wide, widest at or near the middle, free to the base, or nearly so, with a pronounced dorsal midrib. Stamens 5, alternate with the petals, ca. 3 mm long, the anthers yellow at maturity. Carpels 5, in flower ca. 2.5 mm long, the styles erect, ca. 1 mm long. Mature fruit not available.

According to the collectors, the type was collected at the date given above, subsequently flowering at their residence on 27 June 1990 from which herbarium material was made, this constituting the holotype. The photograph (Figure 1) was also made from type material.

Vegetatively, *Sedum booleanum* much resembles species of the genus *Villadia*, but the flowers appear to be like those of *Sedum*, the petals free to the base, or nearly so.

It is a pleasure to name this very attractive red flowered *Sedum* for George Boole Hinton, age 5 (Figure 2), the great grandson of the well-known Mexican collector, George B. Hinton (1880-1943). In spite of his relative youth, George Boole has become a fourth generation plant collector in México. He reportedly often accompanies both his father, George, and his grandfather, James, on various collection expeditions to the Sierra Madre Oriental of northeastern México. Let's hope he continues this familial tradition.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Mark Mayfield for reviewing the manuscript.

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A NEW SPECIES OF *STEVIA* FROM MEXICO

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ABSTRACT

A new species of *Stevia*, ***S. stolonifera*** is described from México.

KEY WORDS: *Stevia*, Asteraceae, México, systematics

The genus *Stevia* consisting of ca. 250 species has two centers of diversification; one in México and another in the Andes Mountains (King & Robinson 1987). Mexican representatives have been comprehensively studied by Grashoff (1972, 1974) who recognized 79 species in his unpublished monograph (dissertation in 1972) and described three additional species in 1974. Since then, five additional species have been described from México (McVaugh 1982; Turner 1992, 1993a, 1993b).

From the view point of reproductive biology, herbaceous species of Mexican *Stevia* are particularly interesting because agamospermy is prevalent among them and specimens with irregular pollen grains (putative apomicts) are known from 32 of the 54 species (Grashoff 1972). To elucidate the evolutionary processes of agamospermy, we are carrying out studies on sexual populations of the herbaceous species. In the course of this study, we have recognized the following novelty.

STEVIA STOLONIFERA Yahara & Soejima, *spec. nov.* TYPE: MEXICO. Jalisco: Sierra del Halo, near a lumber road leaving the Colima highway 7 miles SW of Tecalitlán and extending southeastly toward San Isidro: Steep slopes in mesophytic forests near summits of barrancas in pine zone 13-16 miles from highway; 2000-2200 m; 28-30 Nov. 1959, *R. McVaugh & W.N. Koelz 1169* (HOLOTYPE: TEX).

Steviae origanoideae H.B.K. similis sed rhizomis stoloniferis et foliis crassis subintegris reticulatis differt.

Stoloniferous perenial herbs to 1 m tall. Stems 1-several, simple below, erect, often purplish, puberulous. Internodes as long as leaf blades. Leaves opposite, thick,

semisessile, oblong, 3-5 cm long, 1-2 cm wide, entire or inconspicuously crenate; apex obtuse; base cuneate; upper surface glabrous or sparsely puberulous, glandular-punctate; lower surface paler, reticulate, sparsely puberulous along veins, glandular-punctate. Inflorescence a compound corymb, the total inflorescence up to 4 cm across; branches opposite, puberulous; bracts up to 2.5 cm long, foliaceous, conspicuous. Heads 7-8 mm high, nearly sessile, in small groups ca. 1.0-1.5 cm across. Involucres cylindrical, 4.5-5.5 mm high, sparsely puberulous, sessile-glandular. Phyllaries oblong, acute at apex. Florets white, glabrous, sparsely glandular; lobes ca. 1 mm long, throat plus tube ca. 4 mm long. Achenes heteromorphic, aristate, ca. 2 mm long, dark brown, glabrous except along ribs. Pappus of the 4 adelphocarps of 3 awns, ca. 4 mm long alternating with scales less than 0.2 mm long, fimbriate.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Michoacán: Volcán Paracutín, Mpio. Uruapan, 16 Nov 1983, *F.R. Barrie 553* (TEX); Coalcomán, 20.9 km al Oeste de Coalcomán hacia Coahuayana, terraceria, 550 m, 17 Dec 1984, *C.P. Cowan 4908* (TEX).

This species may be related to *Stevia origanoides* H.B.K. but distinctively differs in stoloniferous rhizomes and thick, nearly entire leaves reticulate beneath. The specimens of *S. stolonifera* were collected from western Michoacán and southeastern Jalisco where typical *S. origanioides* occurs. Among the three specimens cited above, *Cowan 4908* has normal pollen and is regarded as sexual while pollen is irregular in *McVaugh & W. N. Koelz 1169* (holotype) and *Barrie 553* that are therefore considered to be asexual.

ACKNOWLEDGMENTS

We are grateful to Billie Turner for reviewing the manuscript.

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Phytologia (July 1995) 79(1):38-42.

PARONYCHIA HINTONIORUM (CARYOPHYLLACEAE), A NEW SPECIES FROM NUEVO LEON AND VERACRUZ, MEXICO

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ABSTRACT

Paronychia hintoniorum B.L. Turner *spec. nov.*, is described and illustrated. It occurs in the states of Nuevo León and Veracruz, México, and is closely related to the widespread *P. mexicana*, and is well differentiated by both vegetative and floral characters. Distribution maps of the two species are provided.

KEY WORDS: Caryophyllaceae, *Paronychia*, systematics, México, Nuevo León, Veracruz

Routine identification of plants from northeastern México has revealed the following novelty.

PARONYCHIA HINTONIORUM B.L. Turner *spec. nov.* Figure 1. TYPE: MEXICO. Nuevo León: Mpio. Galeana, Rancho Aguililla, ca. 1900 m, 22 Jul 1995, *Hinton et al. 25368* (HOLOTYPE: TEX!).

Paronychia hintoniorum B.L. Turner, *spec. nov.*; similis *P. mexicana* Hemsl. sed foliis oblanceolatis glabriusque, apicibus non spinulosis, et calycibus majoribus glabriusque.

Perennial sprawling or recumbent herbs from lignescent tap roots to 25 cm high, the stems simple, numerous and procumbent from the base of the plant, very sparsely puberulent to glabrous; stipules white-scarious, 3-4 mm long and as wide, acute to rounded apically. Leaves opposite throughout, gradually reduced upwards, those at midstem oblanceolate, 10-25 mm long, 3-7 mm wide, glabrous throughout, the apices obtuse to acute, not clearly apiculate or setose. Flowers axillary, few to numerous in fasciculate or subfasciculate offshoots or clusters. Calyces glabrous, 3.5-4.0 mm long; sepals united below for 1.5-2.0 mm, the lobes 1.5-2.0 mm long, white-marginate, 1-3 nervate, acute apically. Stamens 5, small, ca 1.5 mm long, united below into a scarious sheath. Ovary ca. 1.5 mm high, sparsely short-glandular apically, style ca. 0.3 mm long. Fruits and seeds not available.

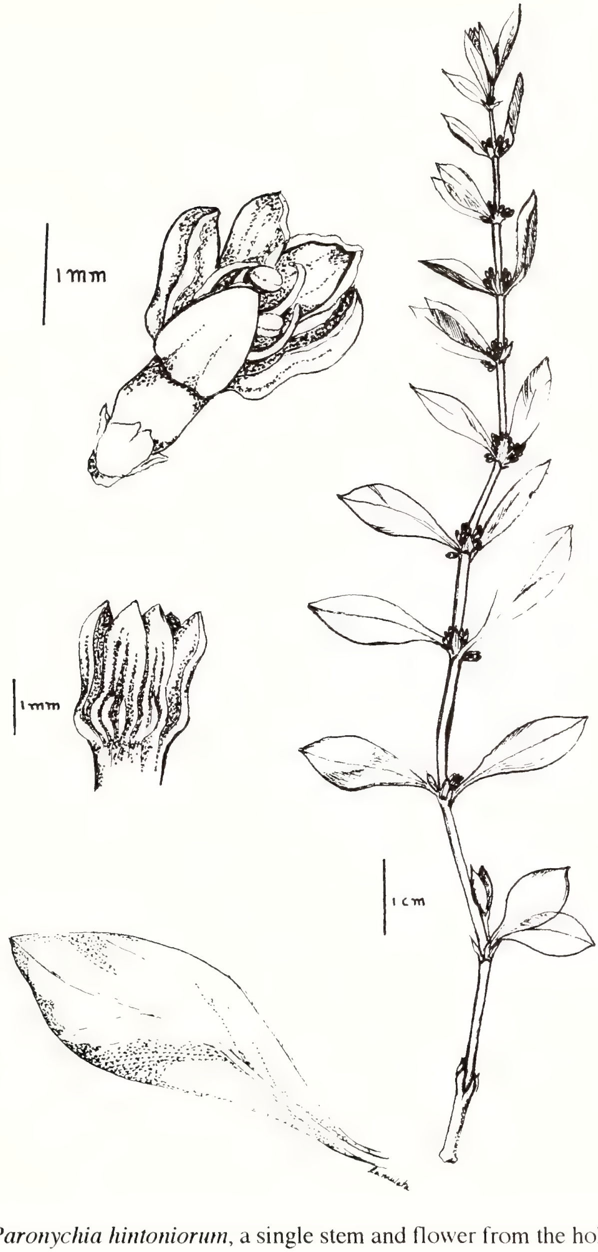

Figure 1. *Paronychia hintoniorum*, a single stem and flower from the holotype.

Figure 2. Distribution of *Paronychia mexicana* (open circles), and *P. hintoniorum* (closed circles).

ADDITIONAL COLLECTION EXAMINED: MEXICO. Veracruz: Mpio. de Perote, Totalco, "Orilla de camino", 2300 m, 7 Jul 1970, *F. Ventura A. 1537* (LL,US).

Paronychia hintoniorum is clearly related to *P. mexicana* Hemsl. but is markedly different in leaf shape and vestiture (oblanceolate, glabrous, and acute to obtuse apically, vs. linear-lanceolate, markedly hirsute and apices spinulose, respectively), and larger glabrous calyces (3.5-4.0 mm long vs. 1.4-2.0 mm) having ribbed lobes (vs. nearly ribless and pubescent).

Both of the above cited collections occur along the periphery of the known range of *Paronychia mexicana* and because of their marked differences are unlikely to be but forms of the latter. I wrote to the Hinton family, upon whose rancho the type collection was made (*cf.* p. 31, this issue), asking them to examine populations at the type locality, especially to ascertain if it might not be weedy at this site. George Hinton, the grandson of the legendary México collector, George B. Hinton, responded:

> I went back to the locality of the *Paronychia* and observed the following: it grows at the base of a limestone hill in colonies of *Agave lechuguilla*. In these colonies it grows with *Acacia* sp., *Acalypha monostachya, Bahia absinthifolia, Berberis trifoliolata, Dyschoriste schiedeana, Ephedra aspera, Flourensia cernua, Gymnosperma glutinosum, Loeselia caerulea, Mortonia palmeri, Opuntia phaeacantha, Yucca filifera*. Less frequently it grows as above with *A. striata* instead of *A. lechuguilla*. Its habit is procumbent although it frequently climbs up on the plants around it. The stems are about 0.25 m; the ones I sent you are much smaller because of the difficulty of getting your hand down to the base of the plant thru the *Agave*. I collected about 12 sheets, with several complete plants which I will send you when dry. It only grows in the agave patches, and these are strung for about 120 m. along the base of the hill. It doesn't appear to be a weed.

He also sent additional sterile material which matched that of previous collections.

I am aware of the wide geographical gap between the only two sites known for this species (Figure 2). The Veracruz specimens are, except for their somewhat smaller leaves and more floriferous condition, almost exactly like that of type material. Label data on Ventura's specimen report the plant as "crece en lugares despejados; abundantes". Veracruz populations of *Paronychia hintoniorum* are located near populational sites of *P. mexicana*, the latter readily recognized by the characters alluded to in the above account. It is perhaps tempting to believe that *P. hintoniorum* might be but a populational growth form of *P. mexicana*; if so, then these must rank as among the most remarkable populational segregates within a single species to my knowledge. In any case, comparable material was not detected elsewhere among the broad range of *P. mexicana* examined in this study. Indeed, Chaudhri (1968) recognized two subspecies under *P. mexicana*, one of these with two varieties. I examined type material of these taxa and all are essentially alike (except for variation in stamen number, a variable organ set as noted by Core [1943]). Apparently, Chaudhri did not examine material of what is here called *P. hintoniorum* or else he would have

surely dubbed this with a name, to judge from his annotations on a broad range of specimens at F, GH, LL, TEX, US.

It is a pleasure to name this taxon for the Hinton family, upon whose property the type locality occurs.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to Piero Delprete and Mark Mayfield for reviewing the paper. The drawing was executed by Marcia Thompson. Distributional maps (Figure 2) are based upon specimens at F, GH, LL, TEX, US.

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A NEW SPECIES OF *PITTOCAULON* (ASTERACEAE, SENECIONEAE) FROM OAXACA, MEXICO

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ABSTRACT

Pittocaulon calzadanum B.L. Turner, *spec. nov.* is described and illustrated. It is a tree 3-5 m high with fore-shortened stems, rayless white heads and pinnate leaves and is known from only a restricted area of Oaxaca, México (Mpio. Santos Reyes Tepejillo). The species does not appear to be especially closely related to yet other taxa of *Pittocaulon*, and future workers might treat the species as belonging to a monotypic genus.

KEY WORDS: Asteraceae, Senecioneae, *Pittocaulon*, systematics, México, Oaxaca

Routine identification of Mexican Asteraceae has revealed the following novelty.

PITTOCAULON CALZADANUM B. L. Turner, *spec. nov.* Figure 1. TYPE: MEXICO. Oaxaca: Distr. Santiago, Juxtlahuaca, Mpio. Santos Reyes Tepejillo, 3 km N of Santos Reyes Tepejillo "a Corral de Piedra" (17° 27′ N × 97° 57′ W), ca. 1770 m, 21 Apr 1995, *J.I. Calzada 19872* (HOLOTYPE: TEX; Isotypes: to be distributed).

Arbor 3--5 m alta. *Caules* terminales non angustati, cicatricibus foliorum delapsorum notati; cortex semisucculenta, textura interior lignea, cellulis resiniferis inspersa. *Folia* alterna; petioli 3--5 cm longi; laminae latae, ovato-ellipticae, pinnatinerviae, 10--20 cm longae, 3--7 cm latae, tomentosae; margine irregulariter lobatae. *Capitulescentia* paniculato-corymbosa 50--100-cephala, aut triangulata aut ovata, pedunculis ultimis tomentosis, saepius 3--8 mm longis. *Involucra* cylindro-campanulata; bracteae interiores 8, lanceolatae, 6--7 mm longae, 1--2 mm latae, tomentosae aetate glabratae, marginibus chartaceis candidis. *Receptaculum* circa 2.5 mm longum, alveolatum, paleis nullis. *Flosculi radiantes* nulli. *Flosculi disci* cujusque capituli 8; corollae candidae, glabrae, 7--9 mm longae, lobis irregularibus 2--3 mm longis, ut videtur lactiferis. *Achenia* (immatura) columnaria, circa 2.5 mm longa, glabra;

carpopodia bene evoluta, annulata; pappi setae capillares, numerosae candidae, 6--7 mm longae, marginibus (praecipue inferne) scabridiusculae.

Tree 3-5 m high. Stems (terminal), abruptly fore-shortened, the bark semisucculent, and the interior with hard woody tissue, the latter suffused with resinous cells. Mature leaves alternate, densely velvety-tomentose, deciduous at anthesis, leaving a pronounced scar; petioles 3-5 cm long; blades broadly ovate to deltoid, pinnately nervate, 10-20 cm long, 3-7 cm wide, moderately tomentose on both surfaces, the margins irregularly lobate. Capitulescence a terminal, ovoid or trianguloid, corymbose panicle of numerous (50-100) heads, the ultimate peduncles tomentose, mostly 3-8 mm long. Involucres cylindrocampanulate, the inner bracts 8, lanceolate, 6-7 mm long, 1-2 mm wide, tomentose, glabrate with age, the margins white-chartaceous. Receptacle ca. 2 mm across, epaleate, alveolate. Ray florets absent. Disk florets 8-10 per head; corollas reportedly white, glabrous, 7-9 mm long; tubes 4-5 mm long; the throat 2-4 mm long, irregularly lobed, the lobes 2-3 mm long, apparently lactiferous. Achenes (immature) columnar, ca. 2.5 mm long, glabrous; carpopodia well-developed, annulate; pappus of numerous white capillary bristles 6-7 mm long, the margins minutely scabridulate, especially below.

Label data describe the tree as 3 m high having white corollas and yellow stamens. It also states that the plant occurs in tropical deciduous forests and is "mass bien escasa". Calzada, who collected the type, revisited the site and tree concerned in July of 1995 (*Calzada s.n.* [TEX]) so as to collect mature leaves (not shown in Figure 1); leaf measurements in the present description were obtained from this collection. José Panero, who also visited the site concerned, states (pers. comm.):

> The new *Pittocaulon* is a very remarkable plant. It is a small tree of the tropical deciduous forest. It can grow to 5 m tall. The leaves are kind of gray-green, somewhat silvery. The plant is an inhabitant of rocky, limestone outcrops. I first saw the plant in March of this year and asked Ismael [Calzada] to collect it. At first, I thought it was going to be a weird *Parthenium*, later I was surprised to see it was a *Senecio*.
>
> It grows with *Fraxinus purpusii, Conzattia multiflora, Xylosma flexuosum, Schoepfia angulata, Erythrina petrea, Croton* sp., *Jatropha* sp., *Bunchosia trifoliata, Quercus glaucoides*, among others.

As noted by Panero, this is a remarkable *Pittocaulon*, the latter a generic segregate from *Senecio* first proposed by Robinson & Brettell (1973), who recognized five species in the genus, all confined to south-central México. Jeffrey (1992) also recognized the genus as distinct, emphasizing its subumbellate inflorescences, cortical resin ducts and palmately veined leaves. Barkley (1985), however, retained *Pittocaulon* in *Senecio* (s.l.) although he now accepts its generic status (pers. comm.). *Pittocaulon calzadanum* has a corymbose-paniculate capitulescence, pinnately veined leaves, eradiate heads, and relatively deeply lobed, white corollas. In short, a very different looking *Pittocaulon* than those described to date. When I first examined the plant I took it to be, because of its narrow white discoid heads, a species of *Digiticalia*, but the woody habit, abruptly foreshortened stems, semisucculent bark and attainment of anthesis before the leaves appear, strongly suggest that it belongs to the *Pittocaulon*

Figure 1. *Pittocaulon calzadanum*, from holotype.

alliance, although some workers, because of its differing capitulescence, pinnately veined leaves, narrow involucres, and rayless white corollas might treat it as a monotypic genus.

It is a pleasure to name this remarkable new species for J. Ismael Calzada, premier collector working out of UNAM, who first collected the taxon concerned.

ACKNOWLEDGMENTS

I am grateful to my wife, Gayle Turner, assisted by Rupert Barneby, for the Latin diagnosis, and to José Panero for calling the plant to my attention. Rupert Barneby and José Panero reviewed the manuscript. The illustration was provided by Marcia Thompson.

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TWO NEW VARIETIES OF *HEDEOMA PALMERI* (LAMIACEAE) FROM NORTHEASTERN MEXICO

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ABSTRACT

Two new infraspecific taxa of *Hedeoma palmeri* are described: var. ***santiagoanum*** B.L. Turner, ***var. nov.***, and var. ***zaragozanum*** B.L. Turner, ***var. nov.*** The former is largely confined to central Nuevo León (Mpio. Villa Santiago) and closely adjacent Coahuila; the latter is largely confined to southern Nuevo León (Mpio. Zaragozana) and closely adjacent Tamaulipas (Mpio. Hidalgo). Their relationships to the two other varieties of *H. palmeri* (var. *palmeri* and var. *galeanum*) are discussed, and the distribution of each in the area concerned is depicted.

KEY WORDS: Lamiaceae, *Hedeoma*, systematics, México

Hedeoma palmeri Hemsl., a member of the subgenus *Poliomenthoides* of *Hedeoma*, is typified by materials from San Luis Potosí. It was treated by Irving (1980) as a single variable species, although he called attention to populations of diversely tomentose individuals from Nuevo León which Turner (1991) subsequently described as var. *galeanum* Turner, sufficiently distinct so as to be placed in its own subspecies. Additional collections from the more montane regions of Coahuila, Nuevo León, and Tamaulipas have revealed two additional infraspecific morphogeographical taxa that appear to warrant names, and these are described herein. Both appear to be closely related to the var. *palmeri* and are positioned within the subsp. *palmeri*. A key to these four varieties is provided below, along with a map showing the distribution of each (Figure 1).

KEY TO THE SUBSPECIES AND VARIETIES OF *H. PALMERI*

1. Leaves bicolored, the lower surfaces densely white-pilose; mostly gypsum outcrops in the vicinity of Galeana, Nuevo León (subsp. *galeanum*). .... var. *galeanum*
1. Leaves not bicolored, about equally green on both surfaces, the lower surfaces moderately to sparsely hirsute (subsp. *palmeri*).......................................(2)

2. Calyx lobes with spreading hairs 0.4-0.6 mm long; midstem leaves mostly 1-2 cm long; San Luis Potosí, Guanajuato, Querétaro, and Hidalgo. . . . var. *palmeri*
2. Calyx lobes glabrate or with hairs appressed, if somewhat spreading then the hairs 0.2 mm long or less; midstem leaves mostly 2-4 cm long; Nuevo León and closely adjacent Coahuila and Tamaulipas..................................(3)
   3. Calyces mostly 4.5-5.5 mm long, the lobes greenish with short spreading hairs 0.1-0.2 mm long; central Nuevo León and closely adjacent Coahuila. .... var. *santiagoanum*
   3. Calyces mostly 5.5-6.5 mm long, the lobes reddish to purplish, glabrate or nearly so (any hairs minute and appressed); southern Nuevo León (Mpio. Zaragozana) and closely adjacent Tamaulipas. .... var. *zaragozanum*

HEDEOMA PALMERI Hemsl. var. ***SANTIAGOANUM*** B.L. Turner, ***var. nov.*** TYPE: MEXICO. Nuevo León: Mpio. Villa de Santiago, between Las Ajuntas and Potrero Redondo, abundant in pine forest, 15 Aug 1939, *C.H. Muller 2702* (HOLOTYPE: TEX!).

H. palmeri Hemsl. var. ***santiagoanum*** B.L. Turner, *var. nov.*, similis *H. p.* var. *palmeri* sed habens folia majora et calyces parviores, hirsutos, 0.1-0.2 mm longos.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Coahuila: Mpio. Arteaga, road from Los Lirios to El Cercado, 2095 m, 29 Jul 1995, *Hinton et al. 25446* (TEX). Nuevo León: Mpio. Villa de Santiago, Pasaje de los Osos al Pte. del Yebanis, Santiago, 19 May 1966, *Marroquin 1311* (TEX); ca. 18 km al S de Monterrey, 16 Sep 1966, *Marroquin 1383* (TEX); Cañon la Boca (100° 19′ W × 25° 24′ N), 1600 m, 10 Sep 1983, *Villarreal 2341* (TEX); 5 km SE of La Trinidad, in Canyon Cebolla, 2000 m, 8 Aug 1988, *Patterson 6321* (TEX); Mpio. Montemorelos, trail up Sierra Cebolla from La Trinidad, 1600 m, 6 Sep 1992, *Patterson 7163* (TEX).

This variety is distinguished from var. *palmeri* by its relatively small calyces, the lobes of which have a short spreading, pubescence, and its relatively large leaves. Occasional specimens appear to weakly approach var. *galeanum* (e.g., *Patterson 71631*), but overall the vestiture of such plants is more like that of var. *palmeri*.

HEDEOMA PALMERI Hemsl. var. ***ZARAGOZANUM*** B.L. Turner, ***var. nov.*** TYPE: MEXICO. Nuevo León: ca. 30 mi NE of Dr. Arroyo along Hwy 29 along the first pass; "open pastureland and heavily forested N-facing slopes . . . infrequent perennial, in clearings", 24° 02′ N, 99° 58′ W, ca. 6000 ft, 9 Sep 1971, *James Henrickson 6628* (HOLOTYPE: LL!; Isotype: MEXU).

H. palmeri Hemsl. var. ***zaragozanum*** B.L. Turner, *var. nov.*, similis *H. p.* var. *palmeri* sed habens folia majora et lobos calycum paene glabros, rubellos.

Figure 1. Distribution of varieties of *Hedeoma palmeri* in northeastern México: var. *galeanum* (closed circles), var. *palmeri* (closed triangles), var. *santiagoanum* (open circles), var. *zaragozanum* (open triangles). Localities vouchered by material at LL TEX.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Nuevo León: Mpio. Zaragoza, Cerro El Viejo, 2400 m, 7 Jul 1992, *Hinton et al. 22103* (TEX); Cerro El Viejo, 2200 m, 29 Jul 1992, *Hinton et al. 22245* (TEX); Cerro El Viejo, 2405 m, 12 Oct 1992, *Hinton et al. 22486* (TEX); Los Potreritos, 1390 m, 2 Aug 1994, *Hinton et al. 24541* (TEX). Tamaulipas: Mpio. Hidalgo, Los Caballos, 1750 m, 21 Sep 1994, *Hinton et al. 24824* (TEX).

The var. *zaragozanum* is a distinctive populational element of the *Hedeoma palmeri* complex and, so far as known, is largely confined to the environs of Cerro El Viejo, mostly between 1400 to 2400 meters where it occurs in pine-oak woodlands. It is readily distinguished from var. *palmeri* by its nearly glabrate, reddish-hued calyx lobes, which characters also serve to distinguish it from var. *santiagoanum*. Future workers might wish to treat the taxon as a monotypic element of its own subspecies.

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A NEW SPECIES OF *CERATOZAMIA* (ZAMIACEAE) FROM OAXACA, MEXICO WITH COMMENTS ON DISTRIBUTION, HABITAT, AND RELATIONSHIPS

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ABSTRACT

Ceratozamia whitelockiana *spec. nov.*, from Oaxaca, México is described and illustrated. The species differs from others in the genus in the upright habit of its few, large, glaucous, pea-green leaves with comparatively long petioles and relatively small megastrobili and microstrobili. It is most closely related to *Ceratozamia miqueliana* Wendland (Vovides *et al.* 1983; Stevenson *et al.* 1986); having similar cones, caudex, and leaf color but differs in the habit, size, and shape of the leaves. *Ceratozamia whitelockiana* is known only from the drainage of the Río Valle Nacional, at elevations from 335 to 975 m.

KEY WORDS: *Ceratozamia*, México, Oaxaca, Zamiaceae, systematics

CERATOZAMIA WHITELOCKIANA Chemnick & Gregory, *spec nov.* TYPE: MEXICO. Oaxaca: Vicinity of Metates, south of Valle Nacional, May 1995, *Chemnick & Gregory 5* (HOLOTYPE: HNT; Isotypes: to be distributed to FTG & XALU. Cultivated specimens at GannaWalska Lotusland, Santa Barbara, California; Mildred Mathias Botanic Garden, UCLA, California; and UCSB Greenhouse, Santa Barbara, California.

Truncus semihypogaeus, ad 30 cm altus; cataphylla lanata, triangularia, 5 cm longa basi 5 cm lata: folia pauca, usque 5, glauca; petiolus teresve, 2.0-2.5 m longus, parte infima dilatatus, pauca spinis armatus; rachis subteres, supra bisulcata, in dimido inferiore, paucis spinis armata, supra fere inermis vel inermis, in cuspidem 10-25 mm longam excurrens; foliala opposita vel subopposita, 30-40 juga, lanceolata vel falcata, 30-50 cm longa, 30-38 mm lata, papyracea, pisacea, tenuia, basi attenuata, apicem attenuata, margine integerrima, revoluta; 22-27 nervis moderata; strobilus microsporangiatis lineari-cylindricus, 26-28 cm longus, 15-28 mm latus; pedunculus tomentosus, 20-30 mm longus, 11-15 mm latus; strobilus megasporangiatis cylindricus, apice mucronatus, 14-18 cm longus, 7.5-10.0 cm latus; pedunculus 1-2 cm longus.

MORPHOLOGY

Stem solitary, semihypogeous, moderately short (20-30 cm), cylindric (12-18 cm in diameter), covered by rough, irregular persistent leaf and cataphyll bases, brownish-red; cataphylls wrinkled, stipulate, triangular, densely white hairy at crown, irregularly arranged on lower portions of stem, 5 cm wide and 5 cm long; leaves 2.0-2.5 m long, usually in whorls of 2-4, recently-emerged and juvenile leaves glaucous on both surfaces, light pea-green, older leaves glabrous, uniformly medium-green on both surfaces, adult plants with up to 2 previous whorls of leaves; petiole 1.00-1.25 m long, terete with an expanded base, 15 mm in diameter at base and tapering gradually to 8 mm at the first leaflet, sparsely armed with simple spines (1-3 mm), spines more densely distributed proximally and becoming sparse distally; rachis nearly straight, subterete, very sparsely armed on proximal 25%, ending in conical-linear apex 10-25 mm long and unarmed; adaxial surface is flattened and shallowly bisulcate with leaflets inserted in the paired grooves up to 5 mm apart, the paired grooves arising distally to the first pair of leaflets; leaflets linear lanceolate to falcate, papyraceous, the median leaflets 30-50 cm in length, gradually attenuate, 30-38 mm in width with 22-27 veins slightly raised on abaxial surface, 30-40 "pairs" inserted on 25-50 mm centers, opposite to sub-opposite, 9-12 mm wide at point of attachment on rachis, margins are slightly revolute and turned upward, basal 25-30% of leaf keeled becoming flattened distally, leaflets gradually reduced in length towards apex; microsporangiate strobilus elongate-conical, solitary, 26-28 cm in length, 28 mm in diameter at base, 15 mm in diameter distally, mucronate, peduncle 20-30 mm in length and 11-15 mm in diameter, tomentose to wooly; microsporophylls 8 mm wide and 3 mm long, sporangia in a single patch, olive green; megasporangiate strobilus cylindrical to ovoid with a large apiculum, solitary, overall length 14-18 cm and diameter 7.5-10.0 cm at maturity, apiculate cap 1.5-3.0 cm in length and 3-5 cm in width, megastrobilus borne on a short peduncle 30-38 mm long and 18-20 mm wide; megasporophyll length 2.5-3.0 cm, sporophyll face 3.5-5.0 cm wide and 17-23 mm long, inner face somewhat glabrous except for the moderately rolled margins which are gray tomentose; sporophyll horns divergent to either side of the sporophyll up to 10 mm long, only slightly raised from the sporophyll face, outer edges grey and tomentose, horns joined by a wrinkled raised edge; megastrobilus with short purple hairs sparsely scattered on sporophyll face and sarcotesta where exposed between megasporopyhlls which are widely separated at maturity by the fully-developed seeds; sarcotesta white, soon turning brown as it ripens; 31-33 mm long, 25-27 mm wide; sclerotesta irregular, ovoid, tan, 24-26 mm long, 18-20 mm wide, smooth with 8-9 indistinct longitudinal ridges.

Etymology: The species is named to honor Mr. Loran Whitelock of Los Angeles, CALIFORNIA for his remarkable dedication and contribution to cycad biology and awareness throughout the world.

DISTRIBUTION AND HABITAT

Ceratozamia whitelockiana is known only from the drainage of the Río Valle Nacional in montane tropical forest within the range of 335-973 m, but occurs more commonly at lower elevations (335-600 m). Habitat consists of very steep slopes

with small pockets of remnant primary forest now covered mostly by coffee and banana groves and secondary growth. The patchy canopy consists of emergent trees to 40 m covered with epiphytes. *Ceratozamia whitelockiana* occurs on heavily shaded east- and west-facing slopes in primary forest with *Chamaedorea* sp., *Geonoma* sp., *Melastoma* spp., *Acanthus* sp., *Ficus* sp., *Begonia* sp., *Selaginella* sp. Soil is light-colored crumbly, rocky clay with outcroppings of sedimentary rock. *Ceratozamia whitelockiana* growing in exposed, deforested areas have extremely bleached, yellow leaves. The entire locality is rapidly being cleared and burned and thus this cycad must be considered endangered. In our most recent survey of the locality in May, 1995 we found approximately 250 plants during 3 days of field work. The same areas were visited several times in 1979, 1980, and 1981 and the population of *Ceratozamia whitelockiana* was considerably larger then, perhaps by twice as many individuals. Since this cycad is seldom seen in collections, it appears that habitat destruction is the greatest threat to its existence. The more inaccessible reaches of the Rio Valle Nacional drainage are likely to contain many pocket populations of *Ceratozamia whitelockiana* but the rapid rate of deforestation will soon reach areas that are currently inaccessible. In May 1995, the smoke from clearing fires was intense and recently cleared fields, as evidenced by still fresh, charred remains, were spread throughout the drainage like a patchwork quilt. This cycad does not seem to persist in open situations or in second growth forest for very long. The only plants we found in cleared areas were artificially maintained by local farmers and appeared bleached and chlorotic.

RELATIONSHIP TO OTHER SPECIES OF *CERATOZAMIA* AND DISCUSSION

The current state of taxonomy within the genus *Ceratozamia* is confused, ambiguous, and incomplete. Three of the most widespread taxa, both in the wild and in cultivation, *C. mexicana* Brongniart (Vovides *et al.* 1983; Stevenson *et al.* 1986), *C. robusta* Miquel (Vovides *et al.* 1983; Stevenson *et al.* 1986), and *C. latifolia* Miquel (Vovides *et al.* 1983; Stevenson *et al.* 1986) are based on vague and obscure descriptions and neotypifications. Locality information is either non-existent or too generalized. Important morphological data such as male and female cone descriptions are incomplete or omitted. When considered from historical perspective, the neotypifications assign the above specific epithets to localities of *Ceratozamia* which do not necessarily correspond to the most likely localities where the original authors and collectors might have been in the mid 1800's when access into México was much more restricted than today. The many isolated populations, forms, ecotypes, and varieties of the large-leaved *Ceratozamia* have been treated within the above three taxa with apparently little regard for valid character differences that in some cases might suggest separation at the species level.

Ceratozamia whitelockiana is distinguished from the other large-leaved *Ceratozamia* as follows: *C. mexicana* has smooth, dark brown, globose stems to 1 m tall and 20 cm in diameter; numerous, glabrous, dark-green, arching leaves which are heavily armed with numerous spines; megastrobili which are on average 35 cm long and 12 cm in diameter borne on a peduncle 10 cm long; microstrobili which are on average 38-43 cm long and 7-8 cm in diameter borne on a peduncle 8-10 cm long and 2.5 cm in diameter. *Ceratozamia whitelockiana* has rough, cylindrical reddish stems that are much smaller than *C. mexicana* and its few, sparsely-armed, upright, glaucous, pea-green leaves with long petioles are strikingly different than the leaves of *C. mexicana* as are the much smaller male and female cones of *C. whitelockiana*.

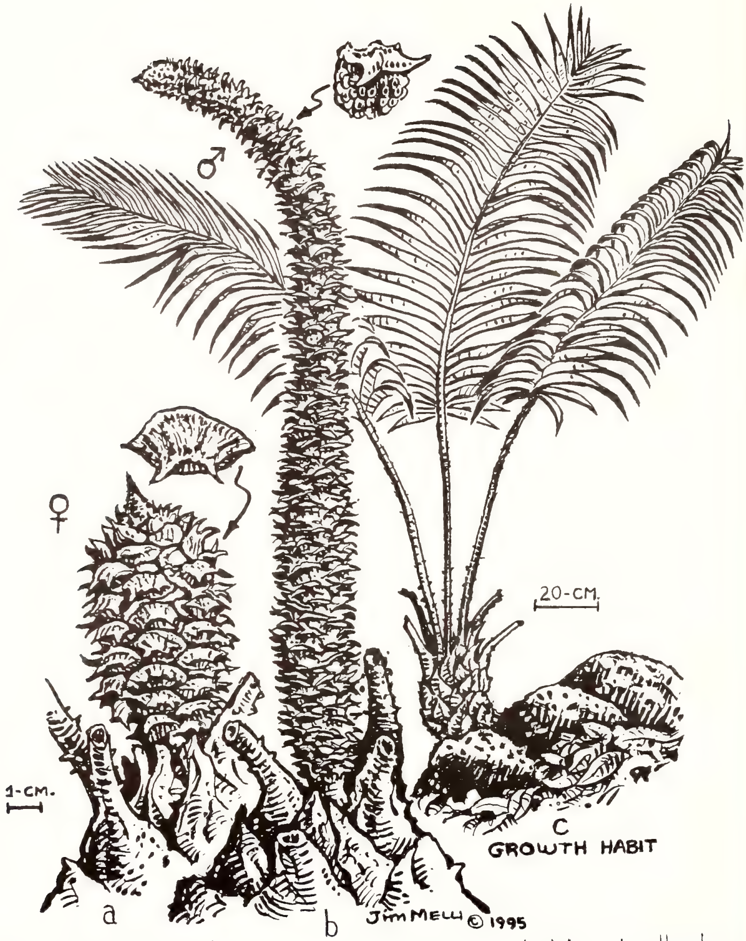

FIG. 1 - Ceratozamia whitelockiana. a, megasporangiate strobilus at pollination. b, microsporangiate strobilus after shedding pollen. c, growth habit.

Ceratozamia latifolia stems are globose, light brown, and frequently sucker, especially in cultivation; leaves are 90-150 cm; leaflets are coriaceous, unequally attenuate, slightly overlapping, 20-30 cm long and 33-43 mm wide. *Ceratozamia whitelockiana* stems are solitary, even in cultivation; leaves are 2.0-2.5 m long; leaflets are papyraceous, 30-50 cm long, 30-38 mm wide, and not overlapping.

Ceratozamia robusta has very large stems to 1.5 m, numerous, heavily-armed, glabrous dark-green leaves to 2.25 m, megastrobili on average 38 cm long and 15.25 cm in diameter borne on a peduncle 7.5 cm long and 28 mm in diameter, microstrobili 45 cm long and 8 cm in diameter. *Ceratozamia whitelockiana* is a much different plant than *C. robusta* based on many characteristics, but especially in the detail of the male and female cones which, as reproductive structures, are characters of the highest weight.

We stress the differences between these two taxa because in Stevenson *et al.* (1986), figure 7, indicates three populations of *Ceratozamia robusta* in north central Oaxaca. One of these populations appears to occur in the drainage of the Río Valle Nacional. Similarly, in their paper on the distribution of *Ceratozamia,* Moretti *et al.* (1980), figure 1, identifies several populations in northern Oaxaca belonging to the *C. mexicana* complex. The localities are not described in the detailed text that precedes the illustration but the placement of one of those populations would appear to be in the Río Valle Nacional drainage. We have searched extensively for other *Ceratozamia* in the drainage of the Río Valle Nacional, from the municipality of Valle Nacional up to 2,200 meters but have only found *C. whitelockiana*.

It is noteworthy that *Ceratozamia whitelockiana, C. robusta*, and *C. mexicana* retain their respective phenotypes even when cultivated for many years under varying conditions. We have grown all three taxa for over fourteen years and found that cultivated individuals are easily distinguished. We make this observation with respect to remarks in Stevenson *et al.* (1986a) regarding the validity of *C. microstrobila* Vovides & Rees. Stevenson *et al.* (1986a) assert that *C. latifolia* and *C. microstrobila*, are the same because "when cultivated in conditions of high moisture and deep shade, plants assignable to *C. microstrobila* 'turn into' plants of *C. latifolia*. Conversely, when plants assignable to *C. latifolia* are exposed to conditions that are dry with high light intensity, they 'turn into' plants of *C. microstrobila*. In our opinion, the plants that have been referred to *C. microstrobila* are nothing more than forms of *C. latifolia* that are phenotypical expressions of environmental conditions. Therefore, we recognize only *C. latifolia* and consider *C. microstrobila* to be a synonym." However, a careful character examination of these two taxa reveals a host of differences that justify separation at the species level. We have similarly cultivated both taxa for seventeen years and have observed cultivated specimens of numerous individuals of both taxa in other gardens and collections, and have never seen the alleged change of phenotypic expression whereby one taxon "turned into" the other, regardless of whether the individuals were grown in full sun, heavy shade, or even in the greenhouse. Therefore we reject the assertion that *C. latifolia* and *C. microstrobila* are synonymous but rather that each is a distinct species. Similarly, we reject any *ad hoc* hypothesis that *C. whitelockiana* is merely an ecotype of *C. robusta* or *C. mexicana*.

Ceratozamia miqueliana has 7-10 leaves that are distinctively different from those of *C. whitelockiana*. The leaflets are fewer (about 15 pairs), wider (60-65 mm),

unequally and abruptly attenuate. The petiole is heavily armed with long, curved spines which is in stark contrast to that of *C. whitelockiana*, which is much longer overall and sparsely armed with much shorter spines. However, there are many similarities between *C. whitelockiana* and *C. miqueliana* that suggest an affinity between the two taxa. Both species have subterranean to shortly arborescent stems of similar size, shape, and color; each with rough, wrinkled, irregular leaf bases and brownish-red cataphylls. Both species have juvenile and adult emergent foliage which is a very distinctive glaucous, pea-green color which matures into papyraceous, slightly revolute leaflets. The mature foliage retains the glaucous coating for some time, eventually giving way to a more glabrous, medium green color in old age. Male and female cones of both taxa are of similar size. The megastrobilus in *C. miqueliana* averages 11 cm long and 6.5 cm wide and is borne on a short peduncle 30 mm long. In *C. whitelockiana*, it averages 15 cm long and 8 cm wide and is borne on a short peduncle 30-38 mm long. The microstrobilus is 20 cm long and 4.5 cm wide in *C. miqueliana* and 26 cm long and 25 mm wide in *C. whitelockiana*. The closest population of *C. miqueliana* to *C. whitelockiana* is approximately 150 km.

Since cytological and genetic evidence currently does not yield any measurable character differences upon which to base species differentiation within the genus (Walters *et al.* 1991), classic taxonomic consideration of characters and weighting of those characters is our basis for conferring specific status to *Ceratozamia whitelockiana* and assigning it to the "*miqueliana* group" which also includes the various forms of *C. miqueliana* and *C. euryphyllidia* Vazquez Torres, Sabato, & Stevenson. It is our hope that workers will continue to investigate *Ceratozamia* in detail to determine the disposition of the many populations and types currently being lumped into vaguely conceptualized and incompletely described taxa that generate confusion and uncertainty rather than create the order, predictability, and sense that responsible taxonomy is supposed to serve.

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Rexford F. Daubenmire (1910-1995)

"Dauby" was the usual appellation applied by graduate students to Dr. Daubenmire, Professor at Washington State University, Pullman, Washington, during the years 1950-1953 while I was working under the aegis of the late Prof. Marion Ownbey (1910-1974) in the area of plant systematics.

I first read about Dauby's death in the obit section of the *New York Times* (8 September 1995). This was a short but well-written account of his professional life and contributions to ecology. Unfortunately it conveyed very little about the man himself. Indeed, most scientists are largely remembered by brief obits prepared by their professional colleagues in which their lives are summed up as lines culled from their latest CV. Subsequent biographers have to invent their other attributes, especially for scientists who are reluctant to write personal letters or expose their psyches.

Perhaps, for many workers, that is as it should be. But I feel otherwise. Indeed, the only previous obits to have been penned by me (Turner 1972, 1975) were both highly personal, although both were solicited. In these I wished to portray the inner essence of the person, his weaknesses and strengths, beauties, foibles, whatever. Whether or not I succeeded in these endeavors is not so important as the attempt, for these will surely provide future biographers with at least some material by which to humanize their subjects. To me, at least, an individual's work cannot be understood solely by publications and their contents.

The present obit is obviously unsolicited. It is written simply because I thought Dauby was a fine researcher, a commendable undergraduate teacher, and a remarkable professional. Certainly, any deep appreciation I have of the field of ecology comes from my enrollment in all of the courses he taught in botany at W.S.U. during the time of my attendance at that institution. These included autecology, synecology, field ecology, and plant geography; I also served as his T.A. in undergraduate courses in general botany, sitting in on all of his freshman lectures on that subject.

Dauby was, for the most part, a calm, even-tempered, rather handsome man. He wore a full mustache above a seemingly perpetual Gioconda-like smile (unusual for most competitive males of my acquaintance, at the time or since). Even when exceedingly irritated he retained that sphinxious grin: along with his expressive eyes, and thin lips, he exuded a detached serenity that belied his inner turmoils.

At the time I knew him, during the prime of his professional career, aged 40-43, Dauby was lean and well-proportioned, about 5 feet ten or so and perhaps 150 pounds. He wore an academic costume to all of his formal lectures: well-creased pants, a professorial tweed coat with leather covered elbows, bowtie, and freshly polished shoes. I remember this well, for the late Art Cronquist (1919-1992), his colleague at the time, for whom I was also a T.A., dressed in just the opposite

fashion, usually a slip-over, much-abused sweater, baggy pants and coat, that looked slept in, occasionally an off-angled mussed tie, and large military-type shoes in various stages of repair. In short, Dauby believed in appearances; Art did not. Like their attires, they were antagonists, but most of the antagonism drifted downward from Dauby. I can still recall a brief statement or two made to himself by Dauby upon hearing the approach of Art along the lower floor of the botany building as Dauby ascended the stairs leading to the second floor, myself along his side. Cronquist, with his six foot eight inch Swedish frame, would usually enter the building with a large booming voice singing whatever song entered his mind, operetta or ballad. On this particular day it was "Oh, she jumped in bed and covered up her head and said I couldn't find her. . .." and carried on through the whole verse (which I myself sang upon occasion, having learned it as a teenager in Texas). Dauby paused for a second, looking at me with grimaced eyes <u>and no</u> smile, saying "That man! God, that man!" Then he trudged on up to the second floor with a perplexed expression.

In Dauby's formal undergraduate lectures he spoke at a slow clip, very precisely, everything biological presented as black or white, with little, if any, gray areas. He drew precise figures on the chalk board and labeled their parts with easily read names. Excellent teacher, answering questions from the floor briefly but adequately.

In upper undergraduate and graduate level courses he was less effective. For example, in autecology, having written the text himself, Dauby did not feel it necessary to <u>lecture</u> on the subject, rather he would meet his classes so as to answer questions about any ambiguities in the text chapters, which we were all expected to have pored over prior to attendance. Most of these classes lasted 10-15 minutes, though sometimes they were prolonged by an overly querulous student. This permitted him to shorten his teaching load and retire to his office (door nearly always closed) so that he might get on with his research or textbook writings.

Dauby took a different tack for his course in synecology (lectures from which he was hoping to develop a text on the subject, and did). He often became rather enlivened by his own spontaneous insights into the field of community ecology, holding forth on succession, its history, comparing community classification to systematic classification, but always with the admonition to accept such comparisons as "analogous to," not "the same as," *etc*. At such times he could be brilliant, but, sadly, he often took himself too seriously. Indeed, I think he did so much of the time, for he seemed to lack a sense of humor, at least where <u>his</u> utterances about ecology were concerned.

To give an example: holding forth on the contribution of F.E. Clements to the field of ecology, especially as regards climax concepts, Dauby suddenly became reiterative, stating that the trouble with American ecology was that everything important in the field of synecology was discovered by Clements, so much so that one might characterize its history as "Before Clements, B.C., B.C., B.C. . .." he finally added, "before Christ" with a full grin, Cheshire-like, something unusual for him; clearly, he much appreciated his effective presentation and original commentary. The class (about 60, mostly graduate students from several disciplines, for Dauby's classes were very popular) laughed appreciatively, including myself, but I raised my hand almost immediately after his riveting delivery and interjected rather loudly, and with much glee, and some laughter, "I now take it we're entering A.D., after Daubenmire!"

Instead of appreciating my joshing spontaneity, he became suddenly furious. Red faced and with grin-turned scowl, he ordered me out of the classroom "Out," he said, "Get out." The class was bewildered, for they had all chortled loudly at my retort, so was I, for I never meant to be disrespectful, merely entertaining, attempting to add to the pedagogic verbalization he'd seized upon.

I did leave the class as instructed, very embarrassed of course, although pleased that my peers had perceived my spontaneous remarks as somehow appropriate. Afterwards I tried to apologize to Dauby, but he would have none of it, although he did relent and permitted me back in his class the following week.

My interpersonal relationships with Dauby were largely developed because of my interest and background in plant systematics. I believe he sought out my conversation, both during field courses in connection with his formal classes in synecology, where sack lunches were the rule, and following this or that class lecture in which allusions were made to the views of systematists generally. I believe he mostly wanted feed-back on his many attempts to make plant community classification "analogous" to organismal classification. "But they are very different," I would assert, "Community ecologists do not have evolutionary theory as a direct underpinning by which to arrange and classify." "Ah," he would respond, "communities evolve, they are made up of plants and animals, all of which coevolve," etc. And he would usually wrap up the conversation pretty quickly with terse sentences that made his points; (Dauby would have made an excellent trial lawyer speaking before an educated jury). Deep down, I think he knew these analogies were basically misleading, dishonest even, for he not only was well aware of Gleason's (a systematist!) individualistic concepts on community structure but, at the time also coexisted with Prof. R.H. Whitaker, his nemesis at Washington State University during my formative years there.

Like most academic professionals, Dauby had considerable concern about his standing in the field of plant ecology, especially as perceived by his peers. I remember well his deep sense of betrayal by the ecological community, if not the man, when the article by Frank Egler, "A commentary on American plant ecology, based on the textbooks of 1947-1949," first appeared in the October, 1951 issue of *Ecology* (32: 673-695). Egler, a very perceptive, erudite, human, to judge from his well-turned article, compared the ecological texts of F.E. Clements, *Dynamics of Vegetation*, 1949; H.J. Oosting, *The Study of Plant Communities*, 1948; and Daubenmire, *Plants and Environment* (*A Text Book of Plant Ecology*). Not only did Egler compare these texts (as indicators of the state of American plant ecology and its development over half a century), he also commented rather freely on the psyches of the authors concerned, especially as related to their academic beginnings. In preparing the present "obit", I re-read Egler's article (after a 44 year hiatus!) and it stills reads as I remember it from my first reading in 1951: a very personal evaluation by a highly skilled communicator with a broad grasp of his field. And he was clearly aware of the controversial nature of his commentaries, noting in his "Postlude," near the end of his article:

> I have been accused in this manuscript, both of being holier-than-thou, and of being satanic. With either accusation, I plead that to be both forceful and modest at the same time is a difficult task. If I appear to claim that I can see farther and from greater heights than some others, it is only - to use Newton's oft-quoted analogy - that those few cubits of stature have been attained by

> climbing on the backs of giants. The giants are there for others to climb, even though the shoulders may bear us ungraciously.

In the fall of 1951 I was enrolled in Daubenmire's course in autecology, for which his text was mandatory, as noted above. I had not given much thought as to how the text might have been written, but after reading Egler's comments, I developed a greater interest in Dauby's style.

Dauby was undoubtedly flattered that Egler possibly ranked him as among the "giants" of American ecology, but Egler was surely correct that the "shoulders [of such workers] may bear us ungraciously." At least that seemed true of Dauby, who brought up Egler's article time and again during the late fall of 1951, complaining that the editors of *Ecology* should ever have published such a commentary. But what most galled him was Egler's paragraph on Dauby's "style of writing," which, in contrast with Clement's style, was said to have

> . . . succeeded to a high degree in developing a terseness, a paucity of words, a fact-crammed grammatical structure that is the goal of many a scientific writer. It is as functional, as devoid of decorative flourishes and artistic ornamentation as the layercake skyscrapers built lately in New York. As was said by the romanticist against the classicist, his writing had become correct and soulless, learned and uninspiring, scientific and godless, virtuous and cold. One can almost imagine that this author, beginning with terse abbreviated lecture notes, kept building through the years in card-catalogue style, inserting abstracts and summaries in their appropriate places as the new literature appeared. For these reasons, the book will long serve as a well-organized reference work for the American literature on the effects of environmental factors on plants.

And that was the way he lectured too, in both undergraduate and graduate courses, except in his autecology course, in which he never lectured, as noted in the above (the text seemingly written from abbreviated sentences on stacks of cards) with practically no sidebar diversions, even when controversy arose from among the students. And, too, that was the way he must have composed his text on Plant Geography (Academic Press, 1978). I attended his first class towards this new textbook venture in the spring of 1953, just before my doctoral defense scheduled for that same semester. My final personal insights into the man's ouvre and psyche involves that class.

I truly looked forward to Dauby's course. Having had a firm background in both plant geography and geology as a result of my master's work at Southern Methodist University in 1949-50, to say nothing of my courses in geomorphology and genetics at W.S.U., I felt primed and excited. Dauby even questioned my "need" to take his course, especially since I had made top grades in nearly all of my courses, and he was well aware of my conversational ability in systematics generally. "Concentrate on your doctoral thesis" he advised, knowing that I was scheduled to finish that same semester. But I told him my thesis was essentially written and that I would truly enjoy the class, *etc.* As a member of my doctoral committee, he relented.

Everything went fine in the course on Plant Geography. Dauby each day perfectly poised and academic, covering the topic from 5 × 8 cards with information not especially new or novel, throwing in this or that study called to the fore since Cain's

fine text on the subject, *Foundations of Plant Geography*, which first appeared in 1944. Nothing new really, until suddenly one day he digressed. Lecturing upon the origin of American deserts and their likely age, he bedazzled me (but perhaps not the class) with his observation that the deserts had developed very recently in North America, and that their floras were probably derived out of mostly recently extinct if not extant elements of the more temperate *Artemisia* shrublands and grasslands of the western Rocky Mountains, if not from conifer forests. The kingpin in this hypothesis, he reckoned, was the fossil *Opuntia* described by Chaney from the Green River shales of Utah, "the earliest and perhaps only fossil cactus from the New World" he noted. "We have to be objective and acknowledge the evidence," he continued, drawing the words out tersely, and afterwards donning that smug Gioconda smile he was so adept at when playing his verbal trump cards.

I disagreed, of course, noting in class, lawyer-like perhaps, that all of the floristic evidence argued against his views: the Cactaceae is not well developed in temperate North America, anyway, if an *Opuntia* had happened to become fossilized in Eocene time, then it merely proved the cacti had been around for eons, and that the center of diversity of cacti in North America lay to the south in Arizona, New Mexico, Texas, mostly subtropical regions, much as suggested by Chaney in his paper, and what about *Fouquieria*, *Idria* (both belonging to the Fouquieriaceae, a family of only two genera confined to the hot deserts of North America without clear familial relationship elsewhere) and many other genera too numerous to mention, to say nothing of the genus *Larrea* which dominates the deserts of two continents, etc. On like that I held forth, and Dauby fumed, even entered this fray with a dead look of castigation. "I stand on the fossil data" he said, but noting at the same time that the state of Florida has as many cacti nearly as Arizona or New Mexico, and "certainly Florida is not a desert." "But the Florida cacti mostly belong to the genus *Opuntia*," I said, "many of these, if not most, of recent introduction or else the results of Small's taxonomic splitting of this or that variable entity. Anyway," I retorted, "The cacti of Florida, so far as evidence bearing on the age and origin of the family Cactaceae, is meaningless." And I forget, now, how our 15 minute debate went, but it ended with a stony silence on Dauby's part, and "I wish you weren't here" - look and an early closure of the lecture for that day.

After that venture into Dauby's card session, upon the advice of my graduate student peers, I kept strictly quiet, dutifully recording his lectures in my own shorthand in preparation for our final exam, which was soon upon us.

The exam was well-structured, very fair, and straightforward, as were all of the exams in the four courses I took from him. But for me, on this particular exam, there was a problem. Dauby asked the question (assigning it 10 points): Give the age and origin of the family Cactaceae (not worded so as to be answered, <u>according to Daubenmire</u>!). Nevertheless, I placed in the appropriate space provided the answer according to Daubenmire, recounting his views very nicely I thought. But at the bottom of my answer I wrote "This is the answer which you might wish, Dr. Daubenmire, but for the <u>correct</u> answer, see the backside of this sheet." There I defended <u>my</u> point of view (and those of many others) regarding this issue.

When the final exam was graded and the semester grades posted, I was surprised to see that I had received a 90 on my final exam (the entire cactus question graded as incorrect) and a B in the course. I inquired of him why he did not accept my answer to

the cactus question concerned. His response was "Well, Turner, you got the answer, but you didn't believe it, or else why did you give an additional answer on the back side of the sheet; in short, you only get to give one answer, not two, that's why you missed the whole question!"

"OK," I said, "But what about the B in the course. I had A's in my earlier exams, and a low A (90) on the final, why a B? Other students with much lower averages received A's [I'd made comparisons among my peers]." "Well," he responded, "let's put it this way, you got a B for Bad Behavior," his eyes full on me dead as a desert duck, no water anywhere.

"Fine," I responded, laughing, "now that I know the standards I won't complain, considering the criteria I'm sure I got it fairly." That was one of the few B's I received in my university education and one that I am proudest of.

But the cactus question did not end there. Daubenmire attended my final defense (of a systematic thesis, a cytotaxonomic study of the genus *Hymenopappus*). After most of my committee members had finished asking this or that question, Dauby, who had said nothing to this point, suddenly said, "Turner, when and where do you think the Cactaceae arose?" I was taken aback, but rising to the occasion (I hoped then), I said strongly and affirmatively, without a glimmer of a smile, "Well, Dr. Daubenmire, do you want my answer, or yours?"

Dauby looked very distressed at my response, folded his papers, got up from the large table which was surrounded by about ten professors, and left the room. He did not approve my performance, but (so I was told) the upper administration, appraised his evaluation negatively and I passed my defense without undue rancor.

As a postscript to the cactus story recounted above, I can't help but add that the fossil *Opuntia* described by Chaney from the fossil beds was, some 18 years later, found to be to a fossilized rhizome and associated root system of a monocot, possibly a sedge (Becker 1962). Upon reading this "inspiring" revelation I sent copy of the article to Dauby, with a little memo, merely stating, "Remember this?" He never responded. Nor did he include an account of his views on the origin of the Cactaceae in his text on Plant Geography. Indeed, published some 25 years after that first class on the subject, Dauby's outlook re American deserts changed considerably, even introducing in his text some of the very same views which I propounded in his first course on the subject.

I hope the above account is not viewed by the reader as a "get-even" article. It is not intended as such (to my knowledge). Rather, I hope in this telling to capture an aspect of the man not generally known. Like most of us he had a mixture of traits some admirable, some not. But, surely some of these affected his research and teaching. In fact, I consider him with his often adamant views and determination to be the foremost ecologist in America (during his heyday) the essential ingredients of most successful scientists. Even at the time I admired his competitive personality, although disagreeing, upon occasion, with his behavior. Certainly he was one of the most organized, clearly focused graduate level teachers to position information in my neural lodgings.

Dauby was the academic father of numerous doctoral students in ecology, many of these friends of mine. For the most part he kept them at a distance; some he favored with warm, but detached, smiles and relatively brief office conferences; others he simply ignored, doubting their competence, begrudgingly entering into their research projects and practically never into their personal problems. Most of his students appeared to stand in awe of the man, even forming cabals among themselves and their leader, constituting a solid phalanx whenever Dauby's views were attacked by W.H. Whitaker or yet others. But that is another telling.

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NEW NAMES AND COMBINATIONS, PRINCIPALLY IN THE ROCKY MOUNTAIN FLORA--IX

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The eighth paper in this series was published in Phytologia 70:231-233. 1991.

ABSTRACT

New combinations are proposed in *Azaleastrum*, *Boechera*, *Oreobatus*, and *Picradenia*. Validations are provided for previously published new combinations in *Coriflora*.

KEY WORDS: *Azaleastrum*, *Boechera*, *Coriflora*, *Oreobatus*, *Picradenia*, Rocky Mountains

Azaleastrum albiflorum Rydb. subsp. ***warrenii*** (A. Nelson) W.A. Weber, *comb. nov.* Based on *Azaleastrum warrenii* A. Nelson, Bot. Gaz. (Crawfordsville) 56:67. 1913.

Boechera pallidifolia (Rollins) W.A. Weber, *comb. nov.* Based on *Arabis pallidifolia* Rollins, *Cruciferae of Continental North America*, p. 181. 1993.

Oreobatus deliciosus (James *ex* Torrey) Rydb. subsp. ***neomexicanus*** (A. Gray) W.A. Weber, *comb. nov.* Based on *Rubus neomexicanus* A. Gray, *Pl. Wrightianae* 2:55. 1853. Synonyms: *Oreobatus neomexicanus* (A. Gray) Rydb., *Rubus deliciosus* James *ex* Torrey var. *neomexicanus* Kearney. This subspecies replaces the Coloradan race, *Oreobatus deliciosus* subsp. *deliciosus* in the southern edge of eastern Colorado and ranges south through New Mexico into southeastern Arizona. Subsp. *neomexicanus* has more distinctly lobed, larger, leaves which are soft-pubescent on both surfaces. Gray was under the misapprehension that *R. deliciosus* had purple flowers, and his major distinction appears to be that in *neomexicanus* the petals are white.

Picradenia richardsonii subsp. ***floribunda*** (A. Gray) W.A. Weber, *comb. nov.* Based on *Actinella richardsonii* (Hook.) Nutt. var. *floribunda* A. Gray, Mem. Amer. Acad. Arts Sci., Ser. 2, 4:101. 1849 (*Plantae Fendlerianae*).

Validation of the generic name *Coriflora* (Ranunculaceae)

Coriflora W.A. Weber, Phytologia 51:372-374. 1982, was invalidly published as a result of the omission of certain information, rectified here.

Coriflora W.A. Weber, *nom. nov.* ≡*Viorna* Spach, *Hist. Nat. Végetaux: Phanérogames* 7:268. 1839, type *Clematis viorna* L., *Sp. Pl.* 543. 1753 (*Viorna urnigera* Spach), nom. illeg., non *Viorna* (Pers.) Reichenbach, *Handb.* 277. 1837, nom. illeg., superfl. renaming of *Muralta* Adams. 1763, nom. rej.

Clematis cirrhosa L. is the type of (Pers.) Reichbach's name; this type was explicitly excluded by Spach by citation (l.c. p. 261) as a synonym of *Cheiropsis elegans* Spach. According to Article 48, *ICBN*, Spach's name is a validly published later homonym for which I am providing a replacement name. While irrelevant to this transaction, according to Pfeiffer, *Nomenclator Botanicus* 1588. 1874, *Clematis*, section *Viorna* antedates Gray, *Syn. Fl. N. Amer.* 1:5. 1895. Formal transfer of the species is effected below.

Coriflora addisonii (Britt. *ex* Vail) W.A. Weber, *comb. nov.* BASIONYM: *Clematis addisonii* Britt. *ex* Vail, Mem. Torrey Bot. Club 2:28, footnote and pl. 3. 1890.

Coriflora albicoma (Wherry) W.A. Weber, *comb. nov.* BASIONYM: *Clematis albicoma* Wherry, J. Wash. Acad. Sci. 21:198, fig. 1. 1931.

Coriflora baldwinii (Torrey & A. Gray) W.A. Weber, *comb. nov.* BASIONYM: *Clematis baldwinii* Torrey & A. Gray, *Fl. N. Am.* 1:8. 1838.

Coriflora beadlei (Small) W.A. Weber, *comb. nov.* BASIONYM: *Viorna beadlei* Small, *Man. Southeast. Fl.* 527, 1504. 1933.

Coriflora bigelovii (Torrey) W.A. Weber, *comb. nov.* BASIONYM: *Clematis bigelovii* Torrey, Pacific Railroad Rep. 4:61. 1857.

Coriflora crispa (L.) W.A. Weber, *comb. nov.* BASIONYM: *Clematis crispa* L., *Sp. Pl.* 543. 1753.

Coriflora fremontii (James) W.A. Weber, *comb. nov.* BASIONYM: *Clematis ochroleuca* Ait. var. *fremontii* James, J. Cincinnati Soc. Nat. Hist. 6:120. 1883.

Coriflora gattingeri (Small) W.A. Weber, *comb. nov.* BASIONYM: *Clematis gattingeri* Small, Bull. Torrey Bot. Club 24:209. 1897.

Coriflora glaucophylla (Small) W.A. Weber, *comb. nov.* BASIONYM: *Clematis glaucophylla* Small, Bull. Torrey Bot. Club 24:337. 1897.

Coriflora hirsutissima (Pursh) W.A. Weber, *comb. nov.* BASIONYM: *Clematis hirsutissima* Pursh, *Fl. Amer. Sept.* 2:385. 1814.

Coriflora integrifolia (L.) W.A. Weber, *comb. nov.* BASIONYM: *Clematis integrifolia* L., *Sp. Pl.* 544. 1753.

Coriflora morefieldii (Kral) W.A. Weber, *comb. nov.* BASIONYM: *Clematis morefieldii* Kral, Ann. Missouri Bot. Gard. 74:665. 1987.

Coriflora ochroleuca (Ait.) W.A. Weber, *comb. nov.* BASIONYM: *Clematis ochroleuca* Ait., *Hort. Kew.* 2:260. 1789.

Coriflora palmeri (Rose) W.A. Weber, *comb. nov.* BASIONYM: *Clematis palmeri* Rose, Contr. U.S. Natl. Herb. 1:118. 1891.

Coriflora pitcheri (Torrey & A Gray) W.A. Weber, *comb. nov.* BASIONYM: *Clematis pitcheri* Torrey & A. Gray, *Fl. N. Am.* 1:10. 1838.
Coriflora reticulata (Walt.) W.A. Weber, *comb. nov.* BASIONYM: *Clematis reticulata* Walt., *Fl. Carol.* 156. 1788.
Coriflora scottii (Porter) W.A. Weber, *comb. nov.* BASIONYM: *Clematis scottii* Porter, *Synops. Fl. Colorado*, p. 1. 1874.
Coriflora texensis (Buckl.) W.A. Weber, *comb. nov.* BASIONYM: *Clematis texensis* Buckl., Proc. Acad. Nat. Sci. Philadelphia. 13:448. 1862.
Coriflora versicolor (Small *ex* Britt.) W.A. Weber, *comb. nov.* BASIONYM: *Clematis versicolor* Small *ex* Britt., *Man. Fl. Northern States and Canada.* 421. 1901.
Coriflora viorna (L.) W.A. Weber, *comb. nov.* BASIONYM: *Clematis viorna* L., *Sp. Pl.* 543. 1753.
Coriflora viticaulis (Steele) W.A. Weber, *comb. nov.* BASIONYM: *Clematis viticaulis* Steele, Contr. U. S. Natl. Herb. 13:364. 1911.

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I am indebted to Dan Nicolson for his advice on the *Coriflora* problem.

Phytologia (August 1995) 79(2):68-76.

NEWLY REQUIRED SUPRAGENERIC NAMES IN VASCULAR PLANTS

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ABSTRACT

Several supra-ordinal names in current use in textbooks and the more technical literature are not validly published. The following are now established: **Cycadidae, Cycadophytina, Ephedridae, Ephedropsida, Equisetidae, Equisetophytina, Ginkgoidae, Ginkgoophyta, Ginkgoophytina, Gnetidae, Gnetophyta, Gnetophytina, Isoetidae, Lycopodiophytina, Magnoliophyta, Magnoliophytina, Ophioglossidae, Pinophyta, Pinophytina, Polypodiophytina, Psilotidae, Psilotophyta, Psilotophytina, Salviniidae, Taxidae**, and **Welwitschiidae**. My own failures in 1992 require formal validation of the superorders **Cornanae, Cyclanthanae, Loasanae, Nepenthanae, Primulanae, Rafflesianae, Sarracenianae**, and **Trochodendranae**. Several ordinal names attributed to G.T. Burnett are invalid as they were proposed at the misplaced rank of section. The following names now in current use are validated: **Acorales, Araliales, Aspleniales, Buxales, Calycerales, Connarales, Hippuridales, Nelumbonales**, and **Vitales**. **Cyphocarpaceae**, a provisional family name proposed by Miers in 1848 is in current use; it is now validated. The revelation that Scrophulariaceae is polyphyletic requires the acceptance of Rhinanthaceae Juss. and recognition of **Schlegeliaceae**.

KEY WORDS: nomenclature, Magnoliophyta

When the three great workers on higher plant phylogeny and nomenclature, Cronquist, Takhtajan, and Zimmermann (1966), joined forces to promote a new system of classification for plants and the use of generic stems throughout all ranks above that of genus, they established a new era of botanical nomenclature for these oft used but rarely fully evaluated names. It was therefore a surprise to discover that several of their, and others (*e.g.*, Tippo 1942; Bold 1957; Ehrendorfer 1971) now commonly used names were not validly published. In all instances noted here, the authors failed to provide a full and direct reference to a Latin description or diagnosis (Art. 36.1; Greuter *et al.* 1994). Many of the names proposed as new by the three were validated earlier by others, most notably Bessey (1907, 1910) and Boivin

(1956); of course, several of the names proposed in 1966 are valid. Nonetheless, the following require validation:

Cycadidae Reveal, *subclass nov.*, validated by a reference to the Latin diagnosis of a J.R.B. Boivin (Bull. Soc. Bot. France 103:493. Dec 1956) isonym of class Cycadopsida A.T. Brongniart (*Enum. Pl. Mus. Paris* xxxii, 136. 12 Aug 1843, as Cycadoideae, validated by a diagnosis in French).

Cycadophytina Cronquist, Takht., & Zimmerm. *ex* Reveal, *subdiv. nov.*, validated by a reference to the Latin diagnosis of a later J.R.B. Boivin (Bull. Soc. Bot. France 103:493. Dec 1956) isonym of Class Cycadopsida A.T. Brongniart (*Enum. Pl. Mus. Paris* xxxii, 136. 12 Aug 1843, as Cycadoideae, validated by a diagnosis in French).

Ephedridae Cronquist, Takht., & Zimmerm. *ex* Reveal, *subclass nov.*, validated by a reference to a H.G.L. Reichenbach (*Fl. Germ. Excurs.* 1(2):156. Jan-Apr 1831, as Tribe Ephedreae) name with a diagnosis in Latin.

Ephedropsida Reveal, *class nov.*, validated by a reference to a H.G.L. Reichenbach (*Fl. Germ. Excurs.* 1(2):156. Jan-Apr 1831, as Tribe Ephedreae) name with a diagnosis in Latin.

Equisetidae Reveal, *subclass nov.*, validated by a reference to a J.R.B. Boivin (Bull. Soc. Bot. France 103:493. Dec 1956, as Division Equisetophyta ["Equisophyta"]) name with a diagnosis in Latin.

Equisetophytina Reveal, *subdiv. nov.*, validated by a reference to a J.R.B. Boivin (Bull. Soc. Bot. France 103:493. Dec 1956, as Division Equisetophyta ["Equisophyta"]) name with a diagnosis in Latin.

Ginkgoophyta Bold *ex* Reveal, *div. nov.*, validated by a reference to a J.R.B. Boivin (Bull. Soc. Bot. France 103:493. Dec 1956, as Class Ginkgoopsida) name with a diagnosis in Latin.

Ginkgoophytina Cronquist, Takht., & Zimmerm. *ex* Reveal, *subdiv. nov.*, validated by a reference to a J.R.B. Boivin (Bull. Soc. Bot. France 103:493. Dec 1956, as Class Ginkgoopsida) name with a diagnosis in Latin.

Gnetidae Cronquist, Takht., & Zimmerm. *ex* Reveal, *subclass. nov.*, validated by a reference to a J.R.B. Boivin (Bull. Soc. Bot. France 103:494. Dec 1956, as Class Gnetopsida) name with a diagnosis in Latin.

Gnetophyta Bold *ex* Reveal, *div. nov.*, validated by a reference to a J.R.B. Boivin (Bull. Soc. Bot. France 103:494. Dec 1956, as Class Gnetopsida) name with a diagnosis in Latin.

Gnetophytina Cronquist, Takht., & Zimmerm. *ex* Reveal, *subdiv. nov.*, validated by a reference to the Latin diagnosis of a later J.R.B. Boivin (Bull. Soc. Bot. France 103:494. Dec 1956) isonym of Class Gnetopsida H.G.A. Engler (*Nat. Pflanzenfam.*, II, 1:2. 26 Mar 1887, as Gnetales, validated by a diagnosis in German).

Isoetidae Reveal, *subclass. nov.*, validated by a reference to a Latin diagnosis associated with a later J.R.B. Boivin (Bull. Soc. Bot. France 103:493. Dec 1956, as Isopsida) isonym of Class Isoetopsida H.G.A. Engler (in H.G.A. Engler & K.A.E. Prantl, *Die Pflanzenfam. Nacht.*: 5. July 1897 with a diagnosis in German).

Lycopodiophytina O. Tippo *ex* Reveal, *subdiv. nov.*, validated by a reference to a F.G. Bartling (*Ord. Nat. Pl.*: 14, 19. Sep 1830, as Class Lycopodiopsida ["Lycopineae"]) name with a description in Latin.

Magnoliophyta Cronquist, Takht., & Zimmerm. *ex* Reveal, *div. nov.*, validated by a reference to a C.A. Agardh (Classes Pl. [2:] 13. 1825, as Class Polycarpellae) name with a description in Latin.

Magnoliophytina D. Frohne & U. Jensen *ex* Reveal, *subdiv. nov.*, validated by a reference to a C.A. Agardh (Classes Pl. [2:] 13. 1825, as Class Polycarpellae) name with a description in Latin.

Ophioglossidae Takht. *ex* Reveal, *subclass nov.*, validated by a reference to a rankless R. Brown (*Prodr.*: 136. 27 Mar 1810, as Ophioglosseae) name with a diagnosis in Latin.

Pinophyta Cronquist, Takht., & Zimmerm. *ex* Reveal, *div. nov.*, validated by a reference to a F.G. Bartling (*Ord. Nat. Pl.*: 90, 92. Sep 1830, as Class Coniferae) name with a description in Latin.

Pinophytina Cronquist, Takht., & Zimmerm. *ex* Reveal, *subdiv. nov.*, validated by a reference to a F.G. Bartling (*Ord. Nat. Pl.*: 90, 92. Sep 1830, as Class Coniferae) name with a description in Latin.

Polypodiophytina Reveal, *subdiv. nov.*, validated by a reference to a J.R.B. Boivin (Bull. Soc. Bot. France 103:494. Dec 1956, as Subdiv. Pteridophytina ["Pterophytina"]) name with a diagnosis in Latin.

Psilotidae Reveal, *subclass nov.*, validated by a reference to the Latin description of a later T. Nakai (*Chosakuronbun Mokuroku* [*Ord. Fam. Trib. Nov.*]: 206. 20 Jul 1943) isonym of Order Psilotales H.G.A. Engler (in H.G.A. Engler & K.A.E. Prantl, *Nat. Pflanzenfam. Nachtr.* 1:5. Jul 1897 with a diagnosis in German).

Psilotophyta B. Boivin *ex* Reveal, *div. nov.*, validated by a reference to the Latin description of a later T. Nakai (*Chosakuronbun Mokuroku* [*Ord. Fam. Trib. Nov.*]: 206. 20 Jul 1943) isonym of Order Psilotales H.G.A. Engler (in H.G.A. Engler & K.A.E. Prantl, *Nat. Pflanzenfam. Nachtr.* 1:5. Jul 1897 with a diagnosis in German).

Psilotophytina O. Tippo *ex* Reveal, *subdiv. nov.*, validated by a reference to the Latin description of a later T. Nakai (*Chosakuronbun Mokuroku* [*Ord. Fam. Trib. Nov.*]: 206. 20 Jul 1943) isonym of Order Psilotales H.G.A. Engler (in H.G.A. Engler & K.A.E. Prantl, *Nat. Pflanzenfam. Nachtr.* 1:5. Jul 1897 with a diagnosis in German).

Salviniidae Pic. Serm. *ex* Cronquist, Takht., & Zimmerm. *ex* Reveal, *subclass nov.*, validated by a reference to the Latin description associated with the type genus by M. Adanson (*Gen. Pl.* 2:15. Jul-Aug 1764).

Taxidae F. Ehrendorfer *ex* Reveal, *subclass nov.*, validated by a reference to the Latin description of the type genus given by S.L. Endlicher (*Syn. Conif.*: 242. Mai-Jun 1847).

Welwitschiidae Cronquist, Takht., & Zimmerm. *ex* Reveal, *subclass nov.*, validated by a reference to a J.R.B. Boivin (Bull. Soc. Bot. France 103:494. Dec 1956, as Class Welwitschiopsida ["Welwopsidia"]) name with a diagnosis in Latin.

My own failure (Reveal 1992) to provide a reference to a validating Latin description or diagnosis means that several superordinal names are not available.

Cornanae Thorne *ex* Reveal, *superord. nov.*, validated by a reference to a S.L. Endlicher (*Gen. Pl. Suppl.* 5:17. 1850, as Subfam. Cornoideae ["Corneae"]) name with a diagnosis in Latin.

Cyclanthanae Thorne *ex* Reveal, *superord. nov.*, validated by a reference to a F.G. Bartling (*Ord. Nat. Pl.*: 67. Sep 1830, as Tribe Cyclantheae ["Cyclanthea"]) name with a diagnosis in Latin.

Loasanae R. Dahlgren *ex* Reveal, *superord. nov.*, validated by a reference to a P.F. Horaninow (*Char. Ess. Fam.*: 147. 1847, as Tribe Loaseae) name with a description in Latin.

Nepenthanae Takht. *ex* Reveal, *superord. nov.*, validated by a reference to a J.H.F. Link (*Handbuch* 1:369. Jan-Aug 1829, as Subfam. Nepenthoideae ["Nepenthinae"]) name with a diagnosis in Latin.

Primulanae R. Dahlgren *ex* Reveal, *superord. nov.*, validated by a reference to a A.J.G.C. Batsch (Tab. Regni Veg.: 206. 2 Mai 1802, as Order Cyathinae) name with a description in Latin.

Rafflesianae Thorne *ex* Reveal, *superord. nov.*, validated by a reference to a description in Latin for the Tribe Rafflesieae H.W. Schott & S.L. Endlicher *ex* E. Spach (*Hist. Nat. Vég.* 10:551. 20 Mar 1841, as "Rafflesiaceae") given by R. Brown (Trans. Linn. Soc. London 19:242. 6 Nov 1844).

Sarracenianae Thorne *ex* Reveal, *superord. nov.*, validated by a reference to the Latin description of Sarraceniaceae given by G. Bentham & J.D. Hooker (*Gen. Pl.* 1:48. 7 Aug 1862).

Trochodendranae Takht. *ex* Reveal, *superord. nov.*, validated by a reference to an A.L. Takhtajan *ex* A.J. Cronquist (*Integr. Syst. Class. Fl. Pl.*: 157. 10 Aug 1981, as Order Trochodendrales) name with a description in Latin.

In reviewing other suprageneric names of vascular plants I discovered that several names proposed by G.T. Burnett in 1835 and previously considered to have been validly published at the rank of order (Cronquist 1981; Reveal 1993), are invalid as they were proposed at the misplaced rank of section (Art. 33.5; Greuter *et al.* 1994). The following names, now in current use, are validated.

Acorales Reveal, *ord. nov.*, validated by a reference to a J.H.F. Link (*Handb.* 1:144. Jan-Aug 1829, as Subfam. Acoroideae ["Acorinae"]) name with a description in Latin.

Araliales Hutch. *ex* Reveal, *ord. nov.*, validated by a reference to an A.L. de Jussieu (*Gen. Pl.*: 217. 4 Aug 1789, as Fam. Araliaceae ["Araliae"]) name with a description in Latin.

Aspleniales Pic. Serm. *ex* Reveal, *ord. nov.*, validated by a reference to a C.B. Presl (Abh. Königl. Böhm. Ges. Wiss., ser. 4, 5:91. 2 Dec 1836, as Tribe Asplenieae ["Aspleniaceae"]) name with a description in Latin.

Buxales Takht. *ex* Reveal, *ord. nov.*, validated by a reference to the Latin diagnosis given by F.G. Bartling (*Ord. Nat. Pl.*: 370. Sep 1830, as "Buxea") for the Tribe Buxeae Dumort. (*Comment. Bot.* xx. 1822).

Calycerales Takht. *ex* Reveal, *ord. nov.*, validated by a reference to a R. Brown *ex* L.C.M. Richard (Mém. Mus. Hist. Nat. 6:74. Nov 1820, as Fam. Calyceraceae ("Calycereae") name with a description in Latin.

Connarales Takht. *ex* Reveal, *ord. nov.*, validated by a reference to an A.P. de Candolle (*Prodr.* 2:84. mid Nov 1825, as Tribe Connareae) name with a description in Latin.

Hippuridales Pulle *ex* Reveal, *ord. nov.*, validated by a reference to a J.H.F. Link (*Enum. Hort. Berol. Alt.* 1:5. 16 Mar-30 Jun 1821, as Fam. Hippuridaceae ["Hippurideae"]) name with a description in Latin.

Nelumbonales Nakai *ex* Reveal, *ord. nov.*, validated by a reference to an A.P. de Candolle (*Syst. Nat.* 2:43. late Mai 1821, as Tribe Nelumboneae) name with a description in Latin.

Vitales Takht. *ex* Reveal, *ord. nov.*, validated by a reference to an A.L. de Jussieu (*Gen. Pl.*: 267. 4 Aug 1789, as Fam. Vitaceae ["Vites"]) name with a description in Latin.

In preparing the list of family names for consideration under the rubric "NCU" (Hoogland & Reveal 1993), we failed to note that Cyphocarpaceae was a provisional name and thus not validly published (Art. 34.1[b]; Greuter *et al.* 1994). In order that this name may continue in use, as was our intent in 1993, it is validated here.

Cyphocarpaceae (Miers) Reveal & Hoogland, *stat nov.*, based on Subfam. Cyphocarpoideae Miers, London J. Bot. 7:61. 1848, as Cyphocarpaceae.

One goal of systematics is to recognize monophyletic taxa. The recent discovery (Olmstead & Reeves 1995) that Scrophulariaceae, as defined by most modern workers, is polyphyletic requires a redefinition of that family. Two approaches can be taken, the reduction of numerous commonly accepted families to synonymy under a single, broadly defined Scrophulariaceae, or a fragmentation of the family into smaller groups reminiscent of the family treatments proposed by Jussieu (1789) and subsequent early nineteenth century authors. In reviewing the options, I have decided to take the latter course and propose the following linear sequence within a broadly defined Scrophulariales:

Scrophulariales Lindl. (1833)
    Acanthales Lindl. (1833)
    Bignoniales Lindl. (1833)
    Gesneriales Dumort. (1829)
    Globulariales Dumort. (1829)
    Lentibulariales Lindl. (1833)
    Pinguiculariales Dumort. (1829)
    Plantaginales Lindl. (1833)
    Rhinanthales Dumort. (1829)
    Veratrales Dumort. (1829)

1. Buddlejaceae K. Wilh. (1910)
2. Retziaceae Bartl. (1830)
3. Stilbaceae Kunth, *nom. cons.* (1831)
4. Bignoniaceae Juss., *nom. cons.* (1789)
    Crescentiaceae Dumort. (1829)
5. Paulowniaceae Nakai (1949)
6. Schlegeliaceae Reveal (1996)
7. Verbasaceae Raf. (1821)
8. Scrophulariaceae Juss., *nom. cons.* (1789)
    Antirrhinaceae Pers. (1807)
    Caprariaceae Martinov (1820)
    Chelonaceae Martinov (1820)
    Gratiolaceae Martinov (1820)
    Limosellaceae J. Agardh (1858)
    Linariaceae Martinov (1820)
    Oxycladaceae (Miers) Schnizl. (1843-1870)
9. Rhinanthaceae Vent., *nom. cons. prop.* (1799)
    Aragoaceae D. Don (1835)
    Buchneraceae (Benth.) Lilja (1870)
    Digitalidaceae Martinov (1820)
    Erinaceae Duvau *ex* Pfeiff. (1873)
    Euphrasiaceae Martinov (1820)
    Melampyraceae Rich. *ex* Hook. & Lindl. (1821)
    Pedicularidaceae Juss. (1789)
    Sibthorpiaceae D. Don (1835)
    Veronicaceae Durande (1782)
10. Oftiaceae Takht. & Reveal (1993)
    Spielmanniaceae J. Agardh, *nom. illeg.* (1858)
11. Ellisiophyllaceae Honda (1930)
12. Orobanchaceae Vent., *nom. cons.* (1799)

Aeginetiaceae Livera (1927)
Phelypaeaceae Horan. (1834)
13. Selaginaceae Choisy, *nom. cons.* (1823)
Hebenstretiaceae Horan. (1834)
14. Globulariaceae DC., *nom. cons.* (1805)
15. Gesneriaceae Dumort., *nom. cons.* (1822)
Belloniaceae Martinov (1820)
Besleriaceae Raf. (1838)
Cyrtandraceae Jack (1823)
Didymocarpaceae D. Don (1822)
Ramondaceae Godr. (1850)
16. Plantaginaceae Juss., *nom. cons.* (1789)
Littorellaceae Gray (1821)
Psylliaceae Horan. (1834)
17. Pedaliaceae R. Br., *nom. cons.* (1810)
Sesamaceae R. Br. *ex* Bercht. & J. Presl (1820)
18. Martyniaceae Stapf, *nom. cons.* (1895)
19. Trapellaceae Honda & Sakisaka (1930)
20. Myoporaceae R. Br., *nom. cons.* (1810)
Bontiaceae Horan. (1834)
21. Acanthaceae Juss., *nom. cons.* (1789)
Justiciaceae Raf. (1838)
Mendonciaceae Bremek. (1954)
Meyeniaceae Sreem. (1977)
Nelsoniaceae (Nees) Sreem. (1977)
Thomandersiaceae Sreem. (1977)
Thunbergiaceae (Dumort.) Lilja (1870)
22. Lentibulariaceae Rich., *nom. cons.* (1808)
Pinguiculaceae Dumort. (1829)
Utriculariaceae Hoffmanns. & Link, *nom. cons.* (1809)

All names necessary for the proposed revision of Scrophulariales are available except for the following:

Schlegeliaceae (Gentry) Reveal, *fam. & stat. nov.*, based on Tribe Schlegelieae Gentry, Fl. Neotrop. Monogr. 25:48. 19 Sep 1980.

The problematic relationship of *Schlegelia, Gibsoniothamnus*, and *Synapsis* with Bignoniaceae and Scrophulariaceae is well known (Monachino 1949; Williams 1970; Gentry 1980; Armstrong 1985). With the discovery of a fourth genus, *Exarata* (Gentry 1992), the distinctiveness of the taxon has become clear, and its nearness to Bignoniaceae confirmed. The fragmentation of Scrophulariaceae, the mandatory recognition of Paulowniaceae, and the unique position of the genera related to *Schlegelia* in the data presented by Olmstead & Reeves (1995) requires the recognition of Schlegeliaceae as a distinct family. Failure to fragment the traditional Scrophulariaceae into smaller families would mean that recognition of Oftiaceae, Ellisiophyllaceae, Orobanchaceae, Selaginaceae, and Globulariaceae is impossible, Bignoniaceae becomes doubtful, and the continued recognition of Pedaliaceae, Martyniaceae, Trapellaceae, Myoporaceae, and even Plantaginaceae dubious. Even the

continued acceptance of Gesneriaceae renders a broadly defined Scrophulariaceae paraphyletic.

The family name Rhinanthaceae (1799) will be proposed for conservation against the earlier Veronicaceae (1782) as the former was widely accepted in the early literature and its generic stem is the basis for Subfam. Rhinanthoideae Link.

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TWO NEW MEXICAN SPECIES OF *SENECIO* (ASTERACEAE)

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ABSTRACT

Two new species of *Senecio* are described from México: ***S. ozolotepecanus*** B.L. Turner, from western Oaxaca, and ***S. viejoanus*** B.L. Turner from southern Nuevo León and closely adjacent Tamaulipas. The former is closely related to *S. picridis* Schauer of the *Triangularis* species-group and the latter is closely related to *S. loratifolius* Greenm. of the *Lugentes* species-group (*sensu* Barkley 1985).

KEY WORDS: Asteraceae, *Senecio*, México, systematics

Routine identification of Mexican comps has brought to fore the following novelties in *Senecio*.

SENECIO OZOLOTEPECANUS B.L. Turner, *spec. nov.* TYPE: MEXICO. Oaxaca: "Dirt road between La Cienegilla and San Gregorio Ozolotepec. Pine forest or cloud forest dominated by *Clethra*, *Pinus* and *Quercus*" 2500-3000 m, 12 Dec 1989, *Andrew McDonald 2970* (HOLOTYPE: TEX!; Isotype: MEXU).

Senecioni picridi Schauer similis sed differt foliis numerosioribus majoribus angustioribus tenuioribusque, bracteis involucri ut videtur multiseriatis, calyculo longitudine bracteas interiores paene aequanti.

Suffruticose shrubs ca. 1 m high. Stems tomentose at first but soon glabrate. Leaves numerous and much overlapping, gradually reduced upwards and extending into the capitulescence. Midstem leaves sessile, briefly clasping, linear to linear-lanceolate, mostly 10-15 cm long, 0.5-1.0 cm wide, markedly white-tomentose beneath, less so or glabrate above, minutely denticulate to entire, the apices narrowly acute. Heads 30 or more arranged in open very leafy corymbose panicles, the ultimate peduncles tomentose, mostly 1-4 cm long. Involucres narrowly campanulate, 11-14 mm high, ca. 10 mm wide (pressed), the outermost bracts (calyculus) nearly as long as the inner, shaggy-white tomentose, the innermost pubescent at the apices with coarse hairs. Ray florets 8; ligules yellow, 8-10 mm long, ca. 3 mm wide. Disk

florets ca. 40 (est.), 8-9 mm long, glabrous throughout; tube ca. 3.5 mm long; lobes triangular, ca. 1 mm long. Achenes (immature) columnar, ca. 2 mm long, pubescent throughout with appressed hairs; pappus of numerous white fragile slender bristles ca. 8 mm long.

This species belong to the ser. *Fruticosa* of *Senecio* (*sensu* Barkley 1985) and is seemingly most closely related to *S. picridis* Schauer, having most of the features of that species, except that the leaves are longer, thinner, more numerous, and markedly overlapping. Additionally, the involucral bracts (including the outermost) are nearly all of the same length and very loosely tomentose throughout, giving the involucre a multiseriate appearance.

Senecio ozolotepecanus might also be mistaken for *S. stoechadiformis*, the latter readily distinguished by its thicker, fewer, entire leaves, naked capitulescence, and well-developed calyculus, the outermost bracts half as long as the inner or less.

SENECIO VIEJOANUS B.L. Turner, *spec. nov.* TYPE: MEXICO. Nuevo León: Mpio. Aramberri, Cerro Viejo, 3400 m, pine woods, 20 Nov 1993, *Hinton et al. 23969* (HOLOTYPE: TEX!; Isotypes: GH,NY).

> *Senecioni loratifolio* Greenm. similis sed capitulis majoribus (involucris plerumque 9-11 mm altis vs. 6-8 mm altis) dispositis plerumque in capitulescentia racemoidea et foliis anguste linearibus (3-6 mm latis) non amplexicaulibus differt.

Simple-stemmed perennials 30-40 cm high from thick woody rhizomes, leaves linear, mostly basal, exauriculate, 0.3-0.6 cm wide, 10-20 cm long, tomentose above and below, with age the upper surface often glabrate. Heads 5-20, arranged in terminal raceme-like corymbs, the ultimate peduncles mostly tomentose, 1-3 cm long. Involucres broadly campanulate, 9-11 mm high, 10-12 mm wide (pressed); bracts ca. 23, linear-lanceolate, apically tufted; calyculus a series of loose bracts which grade into the inner series. Ray florets 13-32, the ligules yellow, 10-20 mm long, 2-4 mm wide. Disk florets numerous (80+), the corollas yellow, glabrous, 6-8 mm long, the tube 2.5-3.5 mm long with lobes ca. 0.8 mm long, somewhat warty on the outer surfaces. Achenes columnar, ca. 3 mm long, pubescent in lines; pappus of numerous white fragile capillary bristles 8-10 mm long.

ADDITIONAL COLLECTIONS EXAMINED: MEXICO. Nuevo León: Peña Nevada, west side of Picacho Onofre, 3230 m, 4 Jul 1959, *Beaman 2687* (TEX); Mpio. Zaragoza, Cerro Viejo, 3310 m, 5 Oct 1992, *Hinton et al. 22394* (TEX); summit of Peña Nevada, 2700-2900 m, "abundant in fir zone", 5 Aug 1983, *Nesom 4805* (TEX). Tamaulipas: Mpio. Miquihuana, 5 km N of Aserradero, ca. 2500 m, 25 Oct 1986, *Hernández S. 2078* (TEX); E side of Peña Nevada, 3500-3600 m, 5 Jul 1985, *McDonald 1614* (TEX); Cerro Peña Nevada, 1 Jun 1975, *Patterson 1523* (TEX); Peña Nevada, 19 Jul 1949, *Stanford et al. 2591* (TEX).

This species is obviously a sister-taxon of *Senecio loratifolius*, differing from the latter in having larger heads which are mostly arranged in raceme-like corymbs, and by the very linear-leaved foliage throughout, those along the stem not at all clasping. *Senecio loratifolius*, so far as known, is confined to the higher peaks of central Nuevo

Leon (Cerro Potosí and closely adjacent peaks in Coahuila) while *S. viejoanus* is restricted to the higher peaks of southern Nuevo León (Cerro Peña Nevada and Cerro Viejo).

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A NEW SPECIES OF *SALVIA* (LAMIACEAE) FROM NUEVO LEON, MEXICO

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ABSTRACT

Salvia jorgehintoniana Ramamoorthy, *spec. nov.* is described and illustrated from southern Nuevo León. It belongs to the sect. *Curtiflorae* of *Salvia*, where it relates to *S. longistyla*, a wide spread, variable species of western and south central México. It differs from the latter in having much larger corollas and smaller, abruptly acuminate calyx lobes.

KEY WORDS: Lamiaceae, *Salvia*, México, Nuevo León, systematics

Routine identification of Mexican plants has revealed the following novelty. To judge from notes and annotations accompanying type material, Dr. T.P. Ramamoorthy, in an earlier independent study, came to the same conclusion. Because of this I have credited him with the name and authorship, although the description and views as to its sectional relationship are those of my own.

SALVIA JORGEHINTONIANA Ramamoorthy, spec. nov. Figure 1. TYPE: MEXICO. Nuevo León: Mpio. Galeana, along road from Agua Blanca to San Miguel, 2020 m, "mixed forest of pine and oak", 28 Aug 1991, *Hinton et al. 23148* (HOLOTYPE: TEX!)

S. longistyla Benth. similis sed corollis 40-50 mm longis (vice corollae 25-40 mm longae), lobis calycum 5-6 mm longis (vice lobi 6-12 mm longi), apicibus abrupte acutatis (vice apicum gradatim acuminatorum).

Figure 1. *Salvia jorgehintoniana* (*Hinton 22456*).

Perennial herbs 0.8-1.0 m high. Midstems sparsely puberulous with mostly down-curved eglandular hairs. Leaves 10-25 cm long, 5-13 cm wide; petioles 4.5-9.0 cm long; blades broadly ovate to subdeltoid, pinnately nervate, sparsely to moderately pubescent above and below, especially along the veins, the margins serrate. Flowers in terminal racemes 20-30 cm long, arranged 4-6 to a node, the pedicels mostly 10-15 mm long, densely pubescent with spreading hairs 0.3-0.5 mm long, mostly eglandular but at least some with weakly developed terminal viscid glands. Calyces 2.1-2.5 cm long, sparsely to moderately pubescent with spreading, mostly glandular hairs to 1 mm long; lobes 5-6 mm long, deltoid, abruptly acute, the upper lobes 3-ribbed. Corollas red, 40-55 mm long; upper lobes 8-10 mm long; lower lobes 5-6 mm long. Stamens exserted for 5-10 mm beyond the apex of the upper lobes; anthers purple, ca. 2 mm long. Style glabrous, extending somewhat beyond the stamens. Seeds ovoid, ca. 3 mm long, 1.5 mm wide, pale yellow, glabrous.

ADDITIONAL SPECIMEN EXAMINED: MEXICO. Nuevo León: Mpio. Zaragoza, Cerro El Viejo, 1935 m, 6 Oct 1992, *Hinton et al. 22456* (TEX).

According to label data, the type was collected from a "large colony". The species is quite spectacular, with very large crimson corollas (up to 55 mm long, not counting the extended stamens and style branches). It belongs to the subgenus *Calosphace*, sect. *Curtiflorae*, where it relates to *Salvia longistyla* Benth., having the general habit, large leaves, and inflorescence of that species, but it differs markedly in having much larger corollas (40-55 mm long vs. 25-40 mm long) and shorter calyx lobes (5-6 mm long vs. 6-12 mm long) with abruptly acuminate apices (vs. gradually narrowing apices). In addition, the vestiture is less glandular-viscid and the styles are glabrous throughout, or nearly so.

Salvia jorgehintoniana is apparently endemic to southern Nuevo León, while *S. longistyla* is fairly widespread, occurring from Durango to Guerrero and across the trans-volcanic belt to Veracruz.

The apellation honors George Hinton, son of James Hinton, and grandson of the late G.B. Hinton, who, in conjunction with his father, has collected many extraordinary plants from the state of Nuevo León.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Piero Delprete for reviewing the paper. Marcia Thompson provided the illustration.

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TAXONOMY OF THE *HEDYOTIS ACEROSA* (RUBIACEAE) COMPLEX

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ABSTRACT

Hedyotis acerosa, a species of the southcentral U.S.A. and northern México, is treated as having four morphogeographical varieties: var. *acerosa*, a widespread very common stiffly erect, fasciculate plant occurring mostly in Texas and Coahuila, México; var. *polypremoides*, an erect nonfasciculate plant of New Mexico, western trans-Pecos Texas and Chihuahua and westernmost Coahuila, México; var. ***potosina*** B.L. Turner, *var. nov.*, a low, mat-forming taxon with elongate corollas, occurring from southernmost Coahuila to San Luis Potosí, México; and var. ***tamaulipana*** B.L. Turner, *var. nov.*, an open, much-branched, wirey-stemmed plant with relatively small flowers occurring in westcentral Tamaulipas, México. A key to these taxa is provided along with maps showing their distribution.

KEY WORDS: Rubiaceae, *Hedyotis*, *Houstonia*, Texas, México, systematics

Attempts to classify Mexican collections of *Hedyotis acerosa* assembled at LL, TEX has prompted the present study. Terrell (1991) provided a brief overview of this complex, which he included in his concept of the genus *Houstonia*. While not pretending to understand fully the taxonomic limits of these two closely related genera, my taxonomic intuition, after comparing representative species of the groups concerned, is that they are best treated as but a single genus, *Hedyotis* having priority.

Distributional maps are based upon specimens on file at LL, TEX, all of these annotated accordingly.

KEY TO THE *HEDYOTIS ACEROSA* COMPLEX IN U.S.A.

1. Stems with leaves decidedly fasciculate; flowers mostly on pedicels 0.3-1.5 mm long; vestiture of stems various, but not uniformly minutely pubescent with down curved hairs; Culberson Co., Texas and eastwards. .... var. *acerosa*
1. Stems with leaves not fasciculate, or very weakly so; flowers, at least some of them, on pedicels 2.0-20.0 mm long; vestiture of stems uniformly minutely pubescent with down-curved hairs .... var. *polypremoides*

KEY TO THE *HEDYOTIS ACEROSA* COMPLEX IN MEXICO

1. Stems with internodes much-shortened, forming low pulvinate mat-like plants mostly 2-5 cm high; corolla tubes mostly 8-10 mm long; southernmost Coahuila and southwards to San Luis Potosí. ....var. *potosina*
1. Stems not as described in the above, mostly 5-15 cm high, forming well-defined rather naked stems; corolla tubes mostly 3-7 mm long...............................(2)
   2. Leaves markedly fasciculate; pedicels 0.3-1.5 mm long (rarely not so on lanky new growth of secondary shoots); vestiture various, but not minutely pubescent with down-curved hairs; common in Coahuila and closely adjacent central Nuevo León. .... var. *fasciculata*
   2. Leaves weakly fasciculate, if at all; pedicels mostly 2-20 mm long; vestiture uniformly minutely pubescent with mostly down-curved hairs (rarely subglabrous in var. *tamaulipana*); Chihuahua, Coahuila and Tamaulipas. ....(3)
3. Corolla tubes mostly 3-4 mm long; calyx lobes 1.5-2.0 mm long; Tamaulipas. ....var. *tamaulipana*
3. Corolla tubes mostly (4-)5-6(-7) mm long; calyx lobes 3-4 mm long; Chihuahua, Coahuila... var. *polypremoides*

HEDYOTIS ACEROSA A. Gray, *Pl. Wright.* 1:81. 1850.
Houstonia acerosa (A. Gray) Benth. & Hook. *f.* (for additional synonymy *cf.* Terrell 1991).

HEDYOTIS ACEROSA A. Gray var. *ACEROSA*

As described by Gray, this is a rigidly erect, fasciculate, sparingly branched plant ca. 15 cm high. Type material was collected by C. Wright in late June of 1849, presumably in present day Kinney or Val Verde County, Texas where Wright would have first encountered the taxon. Wright, in his protologue, also cited a specimen from near Buena Vista, Coahuila, collected by Gregg, among others alluded to; clearly lectotypification is needed, but from the description there is little doubt as to the application of the name.

This variety, in habit, is relatively uniform throughout its range, but its vestiture varies considerably as shown in Figure 2. In the latter illustration, specimens with a mixture of both long and very short, mostly straight hairs are depicted as open circles; those with ± uniformly small straight hairs, and/or ± glabrous are shown as closed circles; specimens intermediate to these extremes shown as half circles. At least a few of the specimens here accepted as var. *acerosa* were annotated by Terrell as subsp. *polypremoides* (*e.g.*, Ector Co., Tex; *Rowell 5605* [LL]).

HEDYOTIS ACEROSA A. Gray var. *POLYPREMOIDES* (A. Gray) W.H. Lewis, Ann. Missouri Bot. Gard. 55:397. 1969.
Hedyotis acerosa A. Gray var. *bigelovii* (Greenm.) W.H. Lewis
Hedyotis polypremoides (A. Gray) Shinners
Houstonia acerosa A. Gray subsp. *polypremoides* (A. Gray) Terrell
Houstonia polypremoides A. Gray
Houstonia polypremoides A. Gray var. *bigelovii* Greenm.

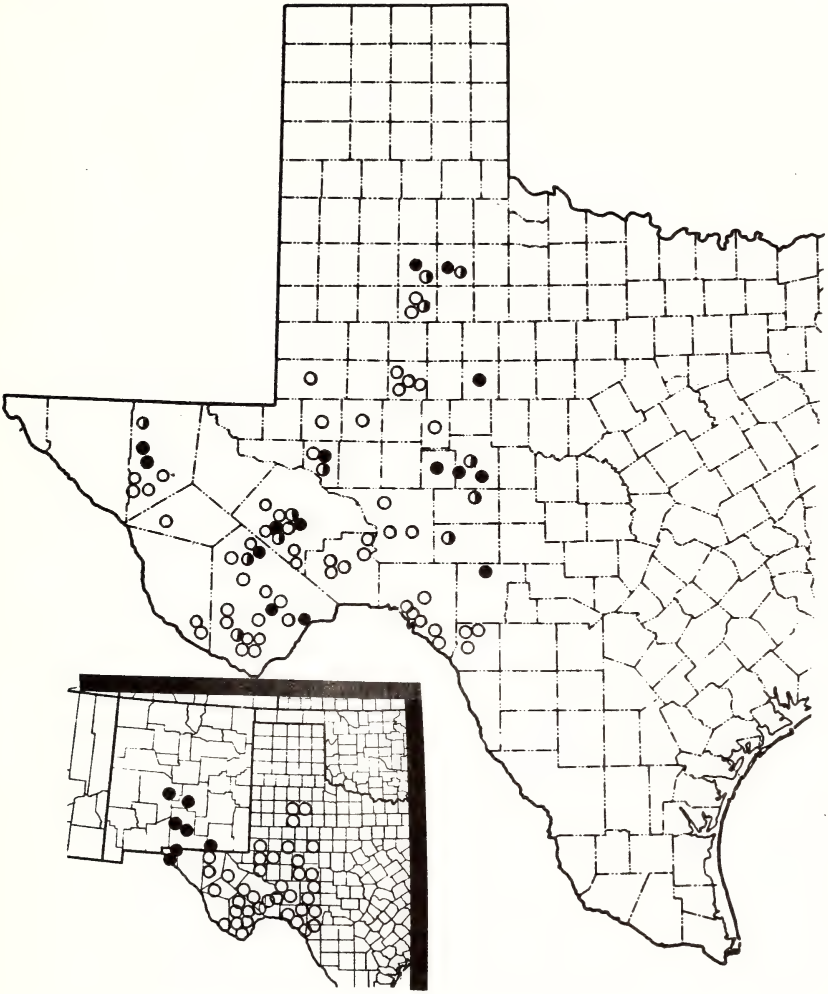

Figure 1. Distribution of *Hedyotis acerosa* var. *acerosa* in Texas: plants with both long and short hairs along the stem, the typical form (open circles); plants with rather uniformly minute straight hairs along the stem, or variously subglabrate (closed circles); plants with intermediate vestiture (half circles). Inset: Distribution of *Hedyotis acerosa* in the U.S.A.: var. *acerosa* (open circles); var. *polypremoides* (closed circles). Intermediates occur in regions of near contact.

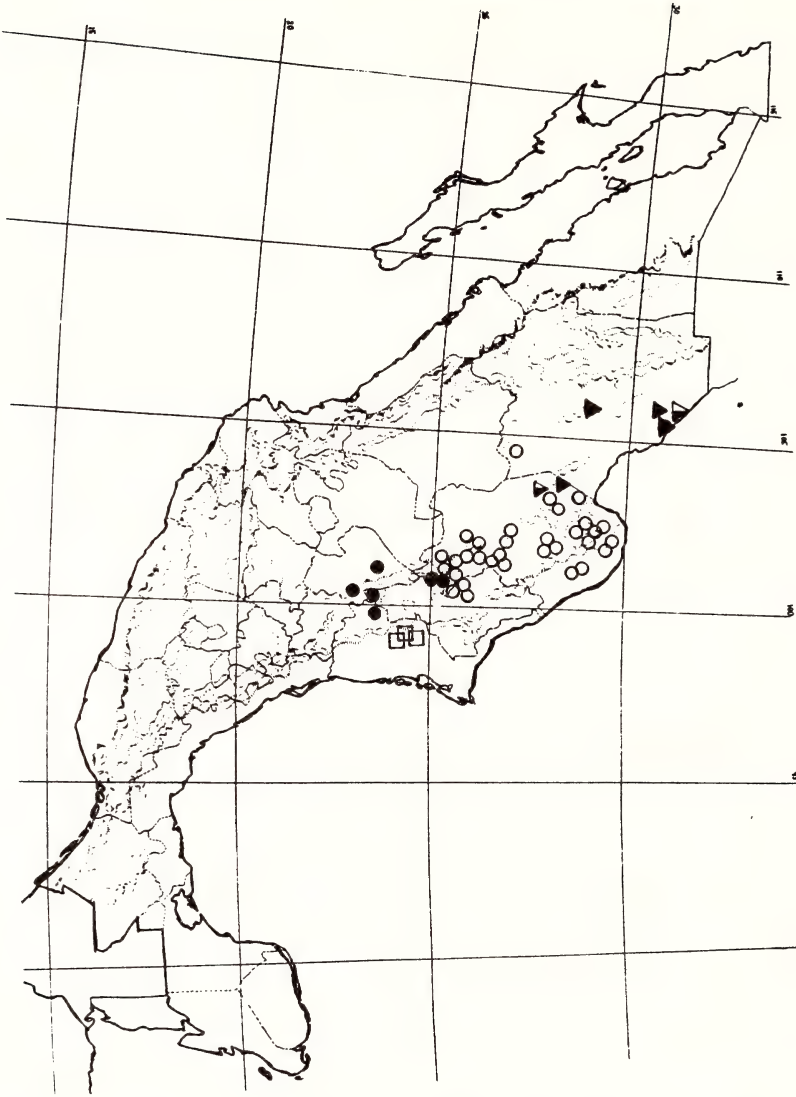

Figure 2. Distribution of *Hedyotis acerosa* in México: var. *acerosa* (open circles); var. *polypremoides* (closed triangles); plants ± intermediate to var. *acerosa* but tending to var. *polypremoides* (half solid triangle); var. *potosina* (closed circle); var. *tamaulipana* (open square).

Lewis (1968) lectotypified this taxon by *Pringle 356* (GH), collected in the Santa Eulalia Mts., Chihuahua (ca. 28° 35′ N, 105° 53′ W). Shinners (1949) accepted this taxon as a good species, but Lewis (1968, 1969) recognized it as but varietally distinct, although Terrell (1991) recognized it as a subspecies. Lewis (1969) took up the name *Hedyotis acerosa* var. *bigelovii* for this taxon, but the current code mandates the varietal name *polypremoides* as correct, much as inadvertently supplied by Lewis.

I accept its varietal status because the taxon clearly grades into the var. *acerosa* in the trans-Pecos region of Texas (*e.g.*, *Whitehouse s.n.* [TEX]; *Young s.n.* [TEX]-both from the Guadalupe Mts.) and in México (*e.g.*, western Coahuila, *Johnston 389* [LL]; *etc.*), mostly along the western periphery of var. *acerosa*, as noted by Terrell (1979).

Occasional plants of var. *acerosa*, either aberrant late-flowering, or cut-back shoots showing new growth, are apt to be mistaken for var. *polypremoides* but individuals of the former can be readily sorted out by their pubescence, as noted in my key.

HEDYOTIS ACEROSA A. Gray var. ***POTOSINA*** B.L. Turner, *var. nov.* TYPE: MEXICO. San Luis Potosí: Charcas, Jul-Aug 1934, *C.L. Lundell 5048* (HOLOTYPE: LL!).

H. acerosa A. Gray var. *acerosa* similis sed plantae 2-4 cm altae (vice 5-15 cm), breves, ramosissimae e basi sunt, tubis corollarum plerumque 8-10 mm longis (vice 4-6 mm).

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Coahuila: mouth of San Lorenzo Canyon, SE of Saltillo, 6200 ft, 2 Aug 1975, *Engard 690* (LL); 4 mi S of Saltillo, 6000 ft, 18 Nov 1958, *Rollins 58125* (LL). Nuevo León: 18 mi E of Matehuala, road to Dr. Arroyo, 5 Aug 1970, *Flyr 1536* (TEX). San Luis Potosí: 16 mi N of Matehuala, 11 Feb 1960, *Johnston 5088A* (TEX); 70 mi S of Matehuala, 2 Sep 1975, *Simpson 7036* (TEX). Tamaulipas: Mpio. Bustamante, 38.8 km N of Tula, 2 Jun 1983, *Barnett 83071* (TEX).

All of the above cited plants, including the type, were annotated by Terrell as subsp. *acerosa*. But, as indicated by label data on *Simpson 7036*, var. *potosina* is a mat-forming plant, having a very different growth habit than found in var. *acerosa*; additionally, the corolla tubes are nearly twice the length of those of the latter, and it occupies a decidedly different geographical region. While treated at the varietal level, it might ultimately prove to be specifically distinct, at least no clear intermediates were found linking var. *potosina* to var. *acerosa*, although the two taxa come in close proximity in the region about Saltillo, Coahuila.

HEDYOTIS ACEROSA A. Gray var. ***TAMAULIPANA*** B.L. Turner, *var. nov.* TYPE: MEXICO. Tamaulipas: Mpio. Villagran, 1 mi E of Ejido de San Lazaro (ca. 24° 35′ N × 99° 13′ W), ca. 1500 ft, 11 Oct 1959, *M.C. Johnston* (with *J. Graham*) *4281k* (HOLOTYPE: TEX!).

H. acerosa A. Gray var. *polypremoides* (A. Gray) W.H. Lewis similis, sed plantae laxe divaricateque ramosae sunt, lobis calycum brevioribus (plerumque 1-2 mm longis vice 3-4 mm), et tubis corollarum brevioribus (plerumque 2-4 mm longis vice 4-6 mm).

ADDITIONAL PLANTS EXAMINED: MEXICO. Tamaulipas: Mpio. San Carlos, 6 mi S of San Carlos on the road to Padilla, 1600 ft, calcareous terraces of Arroyo de San Carlos, 13 Dec 1959, *Johnston 5007A* (TEX); Mpio. Casas, "5 mi E of Casas on the new Victorio-Soto la Marina highway", 28 Sep 1960, *Johnston 5784B* (TEX).

This taxon resembles *Hedyotis acerosa* var. *polypremoides* but the plants are loosely divaricately branched, the calyx lobes shorter (mostly 1-2 mm long vs. 3-4 mm long), and have shorter corolla tubes (mostly 2-4 mm long vs. 4-6 mm long).

Terrell annotated all of the material cited above, including the type, as *Houstonia acerosa* subsp. *polypremoides*. Considering the differences between the latter and var. *tamaulipana*, as outlined in the above, and the disjunct nature of the populations concerned, varietal status for the latter seems justified.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Piero Delprete for reviewing the paper.

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TAXONOMIC STUDY OF *HEDYOTIS PALMERI* (RUBIACEAE)

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ABSTRACT

Hedyotis palmeri (A. Gray) W.H. Lewis (=*Houstonia palmeri* A. Gray) is a species of northcentral México occurring in mostly shallow soils from 1000-2200 m. Two morphogeographical infraspecific categories are recognized: var. *palmeri* (including *H. longipes* S. Wats.), occurring in southeastern Coahuila and most of Nuevo León from 1600-2200 m; and var. ***muzquizana*** B.L. Turner, ***var. nov.***, occurring in northcentral Coahuila mostly at 1000-1600 m. The latter differs from the former in being a taller plant with larger corollas and longer pedicels. A map showing the distributions of the two taxa is included. Lectotypification for *H. longipes* and *H. palmeri* is provided.

KEY WORDS: Rubiaceae, *Hedyotis*, *Houstonia*, México, systematics

Terrell (1991) provided an overview of the genera *Hedyotis*, *Houstonia*, and *Oldenlandia* for North America. In this, *Hedyotis palmeri* (A. Gray) W.H. Lewis was positioned in the genus *Houstonia*, subgenus *Ericotis* Terrell. This subgenus includes *Hedyotis acerosa* A. Gray which I have recently studied (Turner, 1996), concluding that it is seemingly adequately treated as an element of *Hedyotis*. In working over that complex I became interested in the regional variation displayed by *H. palmeri*, hence the present paper.

Terrell did not recognize infraspecific categories under *Hedyotis palmeri*, but a sorting of the specimens available to me, most of these annotated by him, showed that there was a series of populations in northcentral Coahuila made up of larger wirier plants, with larger corollas on more elongate pedicels than occurs in typical populational elements of *H. palmeri*. The two series of populations apparently do not coexist, and while clear intermediates between these are not known, their close relationship is so obvious that I have described the new taxon as but varietally distinct.

A key to these two varieties follow, along with a map showing their distribution (Figure 1), based upon material on file at GH, LL, SRSC, TEX.

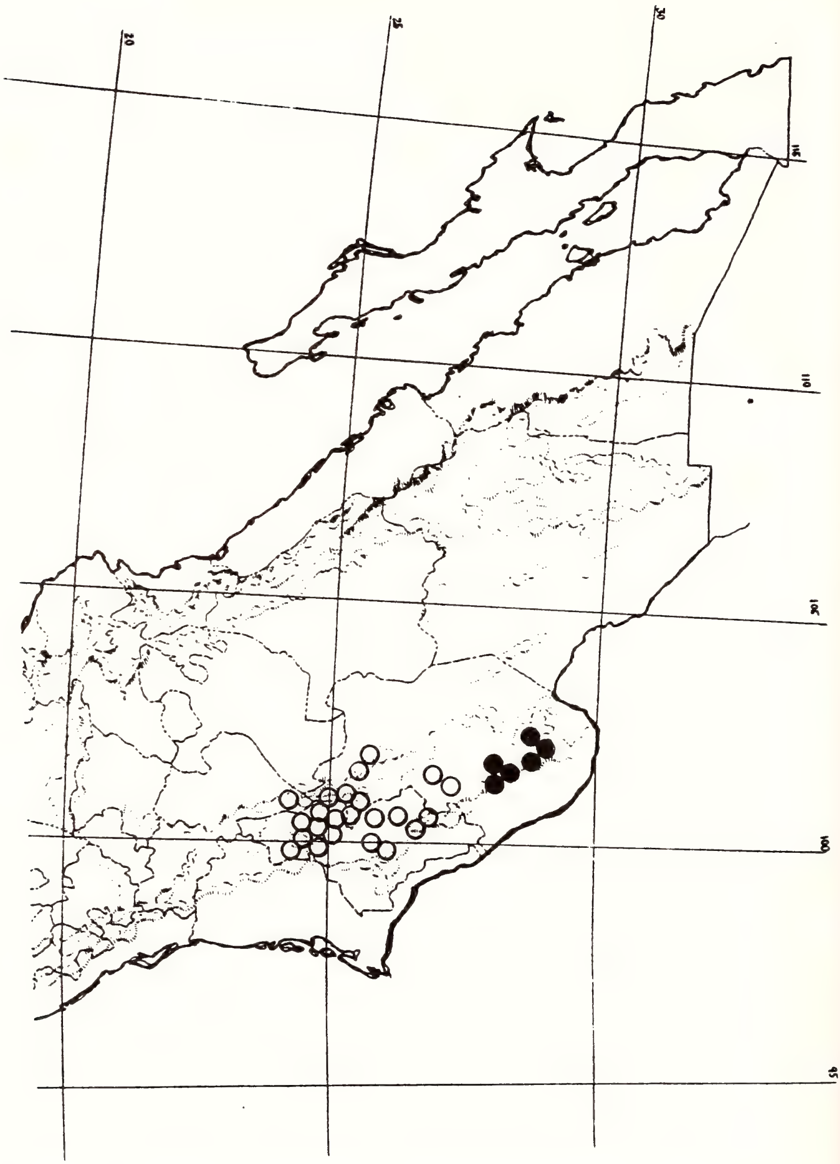

Figure 1. Distribution of *Hedyotis palmeri*: var. *muzquizana* (open circles); var. *palmeri* (closed circles).

Key to varieties of *Hedyotis palmeri*

Mature corolla tubes mostly (6-)8-10 mm long; pedicels mostly 20-30 mm long; n Coahuila...var. *muzquizana*
Mature corolla tubes mostly 4-5(-8) mm long; pedicels mostly 5-20 mm long; s Coahuila, Nuevo León...var. *palmeri*

HEDYOTIS PALMERI (A. Gray) W.H. Lewis var. *PALMERI*, Rhodora 63:222. 1961. BASIONYM: *Houstonia palmeri* A. Gray, Proc. Amer. Acad. Arts 17:202. 1882. TYPE: MEXICO. Coahuila: "Lerios, 45 mi E of Saltillo", Jul 1880, *Edward Palmer 397* (LECTOTYPE [here selected]: GH!). The lectotype is mounted on the same sheet with two other collections, all of these cited in the protologue: *Palmer 398*, Jul 1880, from "40 mi S of Saltillo", and *Palmer 2117*, Jul 1880, from "6 mi E of Saltillo". The several specimens are very similar but the collection selected as the lectotype is better developed as to flowering and fruiting material.

Houstonia longipes S. Wats., Proc. Amer. Acad. Arts 18:97. 1883. *Hedyotis longipes* (S. Wats.) W.H. Lewis, Rhodora 63:222. 1961. TYPE: MEXICO. Nuevo León: Monterrey, Feb 1880, *Edward Palmer 395* (LECTOTYPE [here selected]: GH!). The lectotype is mounted on the same sheet with two other collections: *E. Palmer 394*, Sep 1880, from Monclova, Coahuila, and *Gregg s.n.*, 29 May 1847, from "Cerralbo", Coahuila (?). All of these are very similar and all were cited in the protologue. The Gregg specimens are the only ones having both flowers and fruits, the corolla tubes being ca. 4 mm long. Corollas are absent on the remaining collections.

This is the commonly collected widespread variety of the species and is known to me only by collections obtained from the south and east of var. *muzquizana* (Figure 1).

HEDYOTIS PALMERI (A. Gray) W.H. Lewis var. ***MUZQUIZANA*** B.L. Turner, ***var. nov.*** TYPE: MEXICO. Coahuila: Mpio. M. Muzquiz, ca. 130 road km NW of Muzquiz on Hwy 2A, "midslope of Sa. La Encantada along road up to tunnel entrance to La Encantada basin and mining area. Steep NW - facing slope, . . . common but scattered, mostly in moister microsites", 28° 30′ 40″ N × 102° 19′ 30″ W, 3 Jun 1992, *Guy Nesom 7380* (with M. Mayfield) (HOLOTYPE: TEX!; Isotype: MEXU).

Similis *H. palmeri* (A. Gray) W.H. Lewis var. *palmeri* sed differt tubis corollarum plerumque 8-10 mm longis (vice tuborum plerumque 4-6 mm longorum) et pedicellis plerumque 20-30 mm longis (vice 5-20 mm longis).

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Coahuila: Mpio. M. Muzquiz, Cuesta del Plomo, 1000 m, 7 Jun 1972, *M.C. Johnston et al. 7550p* (TEX); Muzquiz, spring 1935, *Marsh 330* (GH,SRSC,TEX); Santa Rosa Mts., 8 Jul 1938, *Marsh 1251* (GH,TEX); 15 air km NW of La Babia, 18 May 1992, *Mayfield 1426*

(TEX); SW margin of Serranias del Burro, 1400-2100 m, 23 Jun 1991, *Ruiz 47* (TEX); Rancho Agua Dulce, 1 Jul 1936, *Wynd & Mueller 400* (GH).

Nearly all of the specimens cited above have the characters alluded to in the diagnosis, and it is clear that these represent populational units distinct from var. *palmeri*. Additionally, the plants concerned, in general, appear to be taller, wirier, with a less branched inflorescence than occurs in var. *palmeri*.

Terrell annotated several or more of the above sheets as *Hedyotis palmeri* without comment. In spite of numerous collections of var. *palmeri* on file at LL, TEX (40 sheets), I have not detected any clear intermediates between these allopatric entities except for a single collection from "Alamar", Pablillo, SE of Galeana, Nuevo León (*Pennell 17191* [GH]), having corolla tubes 6-8 mm long, otherwise it is similar to var. *palmeri*. Late-flowering specimens of var. *muzquizana*, however, occasionally produce small flowers (e.g., *Wynd & Muller 400*).

It is possible that future field workers will elevate var. *muzquizana* to specific rank, typical specimens differing markedly from var. *palmeri*.

ACKNOWLEDGMENTS

I am grateful to GH and SRSC for the loan of materials. Gayle Turner provided the Latin diagnosis, and she and Piero Delprete reviewed the article.

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Turner, B.L. 1996. Taxonomy of the *Hedyotis acerosa* (Rubiaceae) complex. Phytologia 79:83-88.

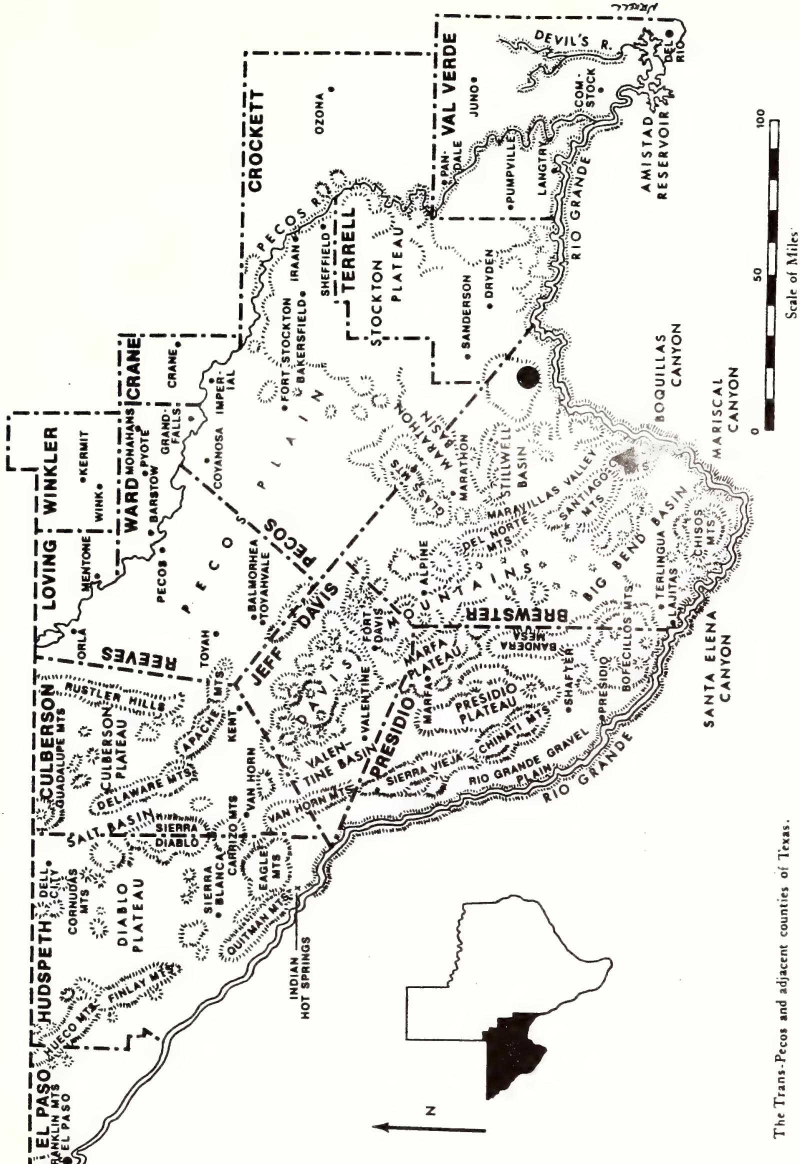

Figure 2. Map showing locations of the localized endemics, *Hedyotis butterwickiae* (circle) and *H. pooleana* (triangle).

Mat-forming perennial herbs 2-3 cm high. Stems glabrous and much-branched from the base, the internodes mostly 1-3 mm long. Stipules lanceolate, 1-2 mm long. Midstem leaves thick, lanceolate, 5-7 mm long, 1.0-1.4 mm wide, strongly 1-nerved, glabrous except for minutely hispidulous margins, the apices decidedly apiculate. Flowering branches not much extending beyond the leaves, if at all. Pedicels 0.1-0.4 mm long. Calyces ca. 2 mm long, the 4 lobes lanceolate, ca. 1 mm long. Corollas 2.5-3.0 mm long, white, the 4 lobes lanceolate, ca. 2 mm long, hispidulous externally at the apices, moderately pilose within. Anthers included within the tube. Styles excurrent for ca. 2 mm. Capsules orbicular ca. 1 mm high, dehiscing loculicidally across the disk. Seeds not available.

Hedyotis pooleana much resembles *H. mullerae* Fosberg of northcentral México but the leaves are markedly different, as noted in the above diagnosis. When first collected Ms. Jackie Poole (conservation biologist and one-time curator at LL, TEX) thought the plant might be *H. mullerae*, which it superficially resembles. Comparisons of her material with ten or more collections of the latter at LL, TEX has shown the distinctiveness of the taxon proposed here. Terrell (1991: Phytologia 71:212-243.) provided an overview of the North American species of *Hedyotis* and related genera, but did not have material of the present species.

Jackie Poole collected the species again at the type locality on 25 May 1985 (*Poole 2527* [SRSC,TEX]). She also informed me that she observed the species on 27 Nov 1987 along the same ridge at about 4840 ft elevation within the boundary of the Big Bend National Park, about a mile or so from the type locality. The Dead Horse Mountains is an extension of the loftier Sierra del Carmen range across the Rio Grande in Coahuila, México. Wells (1965: Southwestern Naturalist 10:256-260.) has provided a vegetational account of this Texas extension.

Northcentral México and closely adjacent trans-Pecos Texas harbor a large array of endemic taxa. This is especially so for *Hedyotis* for the present novelty is apparently restricted to the Dead Horse Mountains, not too far removed from the recently described *Hedyotis butterwickiae* Terrell, the two occurring in close proximity (Figure 2). I can't help but add that both of the individuals for which these two taxa were named, obtained advanced degrees under my direction years ago now, and both are still ardent field workers. Bless such students!

ACKNOWLEDGMENTS

I am grateful to Jackie Poole for calling the novelty to my attention, to Gayle Turner for the Latin diagnosis, and to her and Piero Delprete for reviewing the manuscript.

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A NEW SPECIES OF *SALVIA* (LAMIACEAE) FROM NORTHERN MEXICO

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ABSTRACT

Salvia jaimehintoniana Ramamoorthy *spec. nov.* is described and illustrated. It occurs in Durango, Hidalgo, Nuevo León, and Tamaulipas, and belongs to the sect. *Farinaceae* sensu Epling. It has previously been described as *S. azurea* var. *mexicana* Epling. When elevated to specific status it must take on another epithet, the name *S. mexicana* L. having priority at the species level. Because of this, the new name, *S. jaimehintoniana*, with new typification is proposed. The distinctions between *S. azurea* and *S. jaimehintoniana* are discussed, and a map showing their distributions in Texas and México is provided.

KEY WORDS: Lamiaceae, *Salvia*, México, *Salvia azurea*, systematics

Routine identification of Mexican salvias has prompted the present study.

SALVIA JAIMEHINTONIANA Ramamoorthy, *spec. nov.* Figure 1. TYPE: MEXICO. Nuevo León: Mpio. Zaragosa, 4.3 road mi. S of Zaragosa on the road to Aserradero la Encantada, 20 May 1988, *Burford L. Westlund 24* (HOLOTYPE: TEX!).

Similis *S. azurea* Lam. sed differt lobis superis (conjunctis) calycum acutis (vice loborum obtusorum), bracteis floralibus late ovatis et persistentibus (vice bractearum lanceolatarum et mox deciduarum).

Perennial herbs 30-50 cm high, forming fascicles of tuberous roots. Stems stiffly erect, relatively unbranched or remotely branched, minutely hispidulous to subglabrate, the nodes pilose with hairs 0.6-1.0 mm long. Midstem leaves elliptical, lance-elliptical to lance-obovate, pinnately nervate; petioles 3-15 mm long; blades mostly 4-10 cm long, 1.2-3.5 cm wide, subglabrous or pubescent along the major veins, undersurfaces markedly glandular-punctate, the margins crenulodentate to nearly entire. Flowers 4-8 to a node, arranged in terminal interrupted spikes. Bracts ovate, persistent, 6-10 mm long, 3-5 mm wide, appressed-pubescent dorsally, the margins ciliate. Calyces 6-8 mm long, flaring upwards, 3-5 mm wide at orifice (pressed); upper lip ca. 2 mm long with 7 well-defined hispidulous ribs. Corollas

blue, 15-18 mm long; tubes 2-3 mm long; throats abruptly bulging below, 4-6 mm long (tube and throat 6-10 mm long); lower lip, 3-lobed, 6-9 mm long; upper lip densely puberulous, 3-4 mm long; tubes and throat not papillose within, or but weakly so. Anthers included within the upper lip, attached near the orifice of the throat. Styles pubescent above, the upper style branches ca. 3 mm long, the lower branches ca. 1 mm long. Fruits ovoid, smooth, ca. 2 mm long, 1.5 mm wide.

REPRESENTATIVE SPECIMENS EXAMINED: MEXICO. Durango: Mpio. de Tepehuanes, El Tarahumar, 2720 m, 27 Aug 1983, *Tenorio 4200* (TEX). Hidalgo: 6.5 air km ENE of Jacala, 1700 m, 13 Jul 1991, *Mayfield et al. 820* (TEX). Nuevo León: Mpio. Galeana, above El Carrizo, 1900 m, 16 Oct 1983, *Hinton et al. 18615* (TEX); along road from Agua Blanca to San Miguel, pine-oak forests, 2030 m, 28 Aug 1991, *Hinton et al. 21276* (Hinton herbarium); above Agua Blanca, oakwoods, 2305 m, 4 Jul 1992, *Hinton et al. 22285* (Hinton herbarium); ca. 30 mi S of Monterrey, 13 Aug 1934, *C.H. & M.T. Mueller 1335* (TEX); area of Cerro Peña Nevada, ca. 12 km NE of San Antonio Peña Nevada, N and NW slopes of mt. known locally as Picacho Onofre, Jul 1977, *Wells & Nesom 345, 374, 440* (TEX). Tamaulipas: ca. 6 km NW of Rancho El Cielo, ca. 12 km NW of Gómez Farías, 1900 m, 12 Aug 1991, *Iltis 30724* (TEX).

This species is represented at LL, TEX by twenty or more collections and is presumably the same as *Salvia azurea* subsp. *mexicana* Epling, the latter typified by collections from near Galeana, Nuevo León (Photoisotypes: TEX!; Paratype: *Mueller 1335* [TEX!]). I have given the plants concerned a new specific name with new typification since the name *S. mexicana* L. is preoccupied, precluding the elevation of Epling's subspecific epithet.

Salvia jaimehintoniana belongs to the sect. *Farinaceae* as circumscribed by Epling (1939, 1940), having the perennial habit, interrupted inflorescence with persistent bracts, upper lip of the calyx with 5-7 ribs, and corolla features of species belonging to that difficult complex.

The specimen cited from Hidalgo differs from the other collections in having spreading pilose hairs, the vestiture along the stems mostly 0.5-1.0 mm high; in all other characters, however, it is like the type material. The rather isolated specimen from Durango has all of the features of typical forms of *Salvia jaimehintoniana* except for its somewhat larger corollas and smaller floral bracts.

Salvia jaimehintoniana differs from *S. azurea* in having calyces with the upper fused lobes acute (vs. obtuse) and floral bracts broadly ovate and persistent (vs. lanceolate and early deciduous). The former is confined to México; the latter to the U.S.A. (Figure 1).

Ramamoorthy (by annotation) first called attention to this specific novelty, and I have retained the name which he proposed. He did not, however, recognize its affinities nor provide information as to its sectional affiliation; these are my own. The epithet honors Jaime Hinton, son of the late George Hinton, renown collector of Mexican plants.

Figure 1. *Salvia jaimehintoniana*, from holotype.

Figure 2. Distribution of *Salvia azurea* (open circles, in Texas; it is absent in México); and *S. jaimehintoniana*. Based upon specimens at LL, TEX.

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A NEW SPECIES OF *LUPINUS* (FABACEAE) FROM OAXACA, MEXICO: A SHRUB OR TREE MOSTLY THREE TO EIGHT METERS HIGH

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ABSTRACT

A new species, ***Lupinus jaimehintoniana*** B.L. Turner is described and photographed from near timberline on Cerro Quiexobra, Oaxaca, where it is a subdominant shrub or small tree up to 8 m high, the lower trunks markedly woody and up to 30 cm across. It appears to be closely related to *Lupinus montanus*, having most of the characters of that species, except for its woody habit, much-reduced leaves and stipules, silvery pubescence, and longer floral bracts.

KEY WORDS: Fabaceae, *Lupinus*, México, Oaxaca, systematics

Identification of Mexican plants has revealed the following novelty.

LUPINUS JAIMEHINTONIANA B.L. Turner, *spec. nov.* Figures 1, 2. TYPE: MEXICO. Oaxaca: Mpio. Miahuatlán, Cerro Quiexobra, 3575 m, 15 Oct 1995, *Hinton et al. 26160* (HOLOTYPE: TEX!; Isotype: TEX!).

Similis *Lupino montano* H.B.K. sed frutex vel arbor est, 8 m alto, foliis calium superorum 5-7 foliola habentibus, stipulis 2-10 mm secus petiolos connatis, indumento pilorum curtorum et argenteorum sursum appresso.

Shrubs or trees mostly (1-)3-8 m high, the lower trunks up to 30 cm across. Flowering stems (of new growth) nodose, the vestiture of short silvery, upwardly appressed hairs ca. 0.2 mm long. Leaves at 2-4 nodes below the inflorescence having 5-7 leaflets; stipules 2-3 cm long, fused at the base to the petioles for 2-10 mm; petioles 4-7 cm long; leaflets narrowly elliptic, 3-6 cm long, 0.6-1.2 cm wide, moderately silky appressed-pubescent on both surfaces, the apices acute. Inflorescence a terminal spike 15-30 cm long, ca. 5 cm across. Bracts linear-lanceolate, much exceeding the flowers, markedly pubescent with appressed hairs above and below, the apices mostly narrowly acuminate. Pedicels mostly 7-8 mm

long, pubescent like the stems. Calyx with lower sepals lanceolate ca. 9 mm long (including the short tube), upper (united) lobes broadly ovate, ca. 6 mm long. Corollas reportedly purple; wing petals with claws ca. 3 mm long; blades broadly oval, glabrous, ca. 13 mm long, 9 mm wide, the upper 1/3 corrugate near its base; banner glabrous throughout, sessile or nearly so, ca. 12 mm long and as wide; keel petals glabrous with claws ca. 4 mm long, their blades ca. 7 mm long as measured along the basal axis, then sharply arcuate upwards, the apical axis nearly at right angle to that of the basal axis, the apices acute. Lower stamens with anthers ca. 2 mm long. Pods (immature) ca. 4 cm long, 0.8 cm wide, densely tomentose with contorted subtawny hairs. Mature seeds not available.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Oaxaca: Mpio. Miahuatlán, Quiexobra, 3070 m, 19 Oct 1995, *Hinton et al. 26228* (TEX); 35 km ESE of Miahuatlán, 5 km NE of Santo Domingo Ozolotepec, Cerro Quiexobra, "Timberline vegetation in open glades along ridges and in mountain saddles", 3650-3800 m, 10 Dec 1989, *McDonald 2923* (TEX).

When first collected by Dr. Andrew McDonald (collection cited above), perhaps the first botanist to collect on Cerro Quiexobra, I was too busy with other projects to pursue its identification. Had I known its remarkable habit (as shown in figures 1 and 2) I most certainly would have sought its identity, although McDonald did describe or label the collection as being "Common subarborescent shrubs often forming dense stands along ridges, 1-3 m tall."

Lupinus jaimehintoniana appears to belong to the *L. montanus* Cerv. *ex* Lag. species complex, which was treated in some detail by Dunn & Harmon (1977). These authors recognized five species in the complex, one of these *L. montanus* having five infraspecific categories. Most of these taxa are confined to México and Guatemala and most were originally accepted as "good" species by yet earlier well known mavens of the genus in North America, mainly, C.P. Smith. As species are defined by most current workers in *Lupinus*, the various segregates from *L. montanus* (s.l.) rendered by Dunn & Harmon are about as distinct as yet other species in this or that complex. Nevertheless, were it not for the extraordinary habit of *L. jaimehintoniana* I would probably have followed Dunn & Harmon in recognizing it as but another infraspecific category of *L. montanus*, although having stipules quite different from the latter. In their treatment (1977) *L. jaimehintoniana* will key to *L. montanus* var. *nelsonii* (Rose) C.P. Smith, a taxon known only from eastern Oaxaca, mainly in the pine-fir forests in the sierras to the east of Cd. Oaxaca. In addition to its small stipules, it differs from *L. montanus* in having a silvery upturned vestiture on its stems (vs. tawny and down-curved or glabrous), and mostly longer floral bracts with somewhat contorted apices. *Lupinus montanus* is consistently described as a coarse herb or shrub 1-2 m high, the stems fistulose.

According to Dunn (1984), the largest lupine known to him at that time was a collection of *Lupinus* (the species not named) from Perú, said to be about 4.5 m high and possessing pendant flowering branches. As shown in figures 1 and 2, *Lupinus jaimehintoniana* can develop into relatively large trees, the inflorescences clearly borne terminal and erect.

As communicated by Jaime Hinton (nearly 80 years of age at the time of his ascent of Cerro Quiexobra, accompanied by his faithful friend and colleague, Anacleto Lugo):

> . . . we trailed McDonald's [Dr. Andrew McDonald, currently Research Associate at Harvard University, who made the first extensive collections from Cerro Quiexobra in 1990] redoubtable footsteps over Quiexobra and up to the top of La Sirena (where, two years ago, a great fire reduced the four summits to tall grass and a few trees) . . . [I found myself] staring in "wild surmise" at the Lupine trees, as astonishing to the density of my ignorance as sudden fire to the human skin. (One badly burned and dying old Lupine graciously balanced its thirty feet of height on a real wooden trunk twelve inches across.)
>
> Never in Quiexobra could I grow used to the miraculous blue Lupines held with such accomplished and heart-wringing majesty so high up in the air, as if, by God, who could ever have doubted that a Lupine could even more easily become a magnificent tree than a lovely herb? And I gazed with undying wonder at the beige-colored trunks of dead Lupines burning in the huge fires we built against the icen winds that drove us to bed, only a bit after sundown, as they mercilessly swept up at us from those Oaxacan sierras that by daylight appear tossed like the most gorgeous heaps of pale blue jewels across the whole wide northern world.
>
> I reckon, Billie, Quiexobra does show the mightiest pines and firs still standing in Mexico. And I must admit my wonder at how well the Zapotec's earthen superstition has protected those mossy sprawling giants (*Chirathrodendron pentadactylon*, famed and held in awe for its flowers shaped like little human hands, richly yellow on one side and richly scarlet on the other) from the last few hundred years of mindless ax and fire.
>
> Alas, the enterprising marihuaneros of to-day are no more able to control the rampage of the fires they themselves set to burn the forest for their secret and forbidden plantations, than their fabled stone gods were able to control the marauding rampage of the fiery Iberians.

Judging from its local abundance on Cerro Quiexobra, its resistance to fire and its adaptation to near timberline climates in México, it is likely that the species will prove hardy in the more temperate regions. At least it should prove interesting to ascertain through DNA analysis, *etc.*, what genes might be involved that permit its development into such a bizarre woody member of this otherwise mostly herbaceous genus.

It seems fitting that this remarkable lupine should bear the name of James Hinton, for he has collected with his father numerous lupine species, many of which are types and some of which already bear their names, including *Lupinus hintonii* C.P. Smith (for G.B. Hinton, the elder) and *L. hintoniorum* B.L. Turner (for the extended family).

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NOTES ON COSTA RICAN *PEPEROMIA* (PIPERACEAE), INCLUDING FOUR NEW SPECIES

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ABSTRACT

Four new, ostensibly endemic, Costa Rican species of *Peperomia* are described: ***Peperomia hammelii*** Grayum, ***P. saintpauliella*** Grayum, and ***P. trichomanoides*** Grayum are all terrestrial or epilithic species restricted to the southern Pacific slope, mainly in limestone habitats. ***Peperomia ursina*** Grayum comprises epilithic or epiphytic plants from the lower Atlantic slope of the Cordillera de Talamanca. *Peperomia tenuifolia* C. DC., heretofore considered a synonym of *P. lignescens* C. DC., is reinterpreted as an older name for the species heretofore called *P. killipii* Trel. Revised synonymies are provided for *P. lignescens* and *P. tenuifolia*.

KEY WORDS: Costa Rica, *Peperomia*, Piperaceae, systematics

The Costa Rican members of the huge, pantropical genus *Peperomia* (Piperaceae) were most recently treated by Burger (1971), who accounted for 66 species. Since that time, intensive collecting efforts in previously underexplored regions of the country (particularly the Cordillera de Talamanca) have resulted in the addition of at least fifteen species to this total. Most of these additions have involved species already described from other countries, but a few appear to represent new taxonomic entities. Four new Costa Rican species of *Peperomia* are described hereunder, and a fifth additional species is freed from synonymy under a name accepted by Burger.

PEPEROMIA HAMMELII Grayum, *spec. nov.* TYPE: COSTA RICA. Puntarenas: Cantón de Osa, Fila Costeña, Fila Cruces, cabeceras del Río Piedras Blancas, Cerro Anguciana, faldas al oeste, bosque en roca de cal, 8° 48′ 56″ N, 83° 10′ 37″ W, 1,400-1,600 m, 10 Dec 1993, *Hammel 19274* (HOLOTYPE: INB!; Isotypes: BM!,COL!,CR!,F!,MO!).

P. lignescens C. DC. affinis, a que imprimis differt caule trichomatibus multiseriatis vesicariis vestito petiolis in longitudinem late alatis laminis foliorum hirsutis pedunculis longioribus.

Plants terrestrial or epilithic. Stems erect, to ca. 23 × 0.2-0.5 cm, densely clothed with stout, multiseriate, inflated hairs to ca. 1 mm long. Leaves alternate. Petiole 1.2-4.6 cm, broadly alate throughout its length, ca. 2-6 mm wide, hirsute on both sides. Lamina 5.5-11.0 × 2.5-7.2 cm, ovate to broadly elliptic, impeltate, broadly cuneate to rounded or subcordate at base, subacute to subacuminate apically, pinnately nerved with ca. 5-6 primary lateral veins per side, dark-gland-dotted and hirsute on both surfaces. Inflorescences solitary at stem apex. Peduncle 2.7-3.8 cm, to ca. 1 mm wide, glabrous or with few scattered hairs toward base. Spike 1.7-8.5 × 0.2-0.4 cm, white. Flowers moderately separated; rachis glabrous; bracts 0.5-0.6 mm wide, suborbicular, densely glandular-punctate; anthers broadly elliptic to oblong, ca. 0.25 mm. Fruits unknown.

Peperomia hammelii is known only from the type locality, on the western slope of Cerro Anguciana, the highest peak in the Fila Costeña in the southern Pacific region of Costa Rica. Here, it grows on or near limestone cliffs or outcrops at 1,400-1,600 m elevation.

Peperomia hammelii is an unusually well-marked species in uniquely combining two features which, even by themselves, are anomalous within the genus: an indument of odd, inflated hairs, and broadly and extensively alate petioles. In its terrestrial or epilithic habitat, erect, caulescent habit, alternate, pinnately veined leaves and dark, sessile laminar glands it most closely resembles *P. lignescens* C. DC. and allies, to which it is perhaps intimately related. *Peperomia lignescens*, which is parapatric and at least conceivably syntopic with *P. hammelii*, differs from the latter in having generally puberulent or glabrescent (rather than hirsute) foliage and shorter peduncles (in addition to the characters mentioned previously).

I take great pleasure in dedicating this new species to its discoverer, Dr. Barry E. Hammel of the Missouri Botanical Garden, a long-time student of the Neotropical flora and my colleague on the "Manual to the Plants of Costa Rica" project.

Numerous Costa Rican collections have accrued in recent years of yet another *Peperomia* species that agrees in a general way with the description of *P. lignescens*, but which differs in having consistently palmate leaf venation. These collections are all from the humid Pacific lowlands (0-1,600 m), south from the Río Grande de Tárcoles. They key out easily to *Peperomia killipii* Trel. in Yuncker's (1950) *Flora of Panama* treatment, and are an excellent overall match for the holotypes of *P. killipii* and its synonym (*fide* Yuncker) *P. hymenodes* Trel.

Peperomia lignescens was not treated by Yuncker (1950), while *P. killipii* was only briefly mentioned by Burger (1971: 65) in comparison with *P. pseudodependens* C. DC. (=*P. asarifolia* Schltdl. & Cham.), a somewhat similar species that also has palmate venation. Due to the venation difference, *P. killipii* will not key out anywhere near *P. lignescens* in Burger's (1971) treatment. Nevertheless, type material of both *Peperomia aguacatensis* C. DC. and *P. tenuifolia* C. DC., two of the five heterotypic names listed in synonymy under *P. lignescens* by Burger (1971), agrees in all critical

details with that of *P. killipii*. As both *P. aguacatensis* and *P. tenuifolia* substantially predate *P. killipii*, the last-mentioned name must fall into synonymy.

The following paragraphs provide what I presently consider to be complete synonymies for the two species I propose be called *Peperomia lignescens* C. DC. and *P. tenuifolia* C. DC. This is necessary not only to clarify the confusion detailed above, but also to establish precedent in two cases of equal priority.

PEPEROMIA LIGNESCENS C. DC., J. Bot. 4:137. 1866.
Peperomia carlosiana C. DC., J. Bot. 4:140. 1866.
Peperomia carthaginensis C. DC., Linnaea 37:377. 1872. *Peperomia lignescens* C. DC. var. *carthaginensis* (C. DC.) Trel., Contr. U.S. Natl. Herb. 26:193. 1929.
Peperomia lignescens C. DC. var. *subcuneilimba* Trel., Contr. U.S. Natl. Herb. 26:193. 1929.
Peperomia jilotepequeana Trel. & Standl. *in* Standl. & Steyerm., Fieldiana, Bot. 24(3):254. 1952.

PEPEROMIA TENUIFOLIA C. DC., Linnaea 37:371. 1872.
Peperomia aguacatensis C. DC., Linnaea 37:376. 1872.
Peperomia killipii Trel., Bot. Gaz. 73:143. 1922.
Peperomia hymenodes Trel., Contr. U.S. Natl. Herb. 26:43. 1927.

Peperomia tenuifolia differs from *P. lignescens* not only in its palmate leaf venation, but also in its usually epiphytic habit (it may occasionally be epilithic), absence of conspicuous dark, sessile laminar glands, and minutely papillate inflorescence rachis. Furthermore, it is a species of generally lower elevations (though there is considerable overlap). I select the names *P. lignescens* and *P tenuifolia* because they have already been more widely applied in herbaria than their alternatives, and because both *P. carlosiana* and *P. aguacatensis* are inappropriate toponyms.

PEPEROMIA SAINTPAULIELLA Grayum, *spec. nov.* TYPE: COSTA RICA. Puntarenas: along short-cut road to Golfito from Villa Briceño on Interamerican Hwy., W side of Fila Gamba, ca. 6 km from Golfito airport, 8° 41′ 30″ N, 83° 12′ W, < 100 m, 6 Mar 1985, *Croat & Grayum 59911* (HOLOTYPE: CR!; Isotypes: BM!,MO!).

P. insueta Trel. affinis, sed differt laminis foliorum (1.7-)2.0-3.9 cm longis ovatis vel suborbicularis pedunculis 1.6-3.7 cm longis spicis 7.3-16.1 cm × 0.4-1.0 mm.

Plants terrestrial or epilithic. Stems erect to ± decumbent, 0.8-1.3 × 0.2-0.3 cm. Leaves alternate in basal rosette. Petiole 1.3-7.4 cm, spreading-hirsute with uniseriate hairs. Lamina (1.7-)2.0-3.9 × 1.80-4.65 cm, broadly ovate to orbicular (or rarely obovate), impeltate, cordate or (rarely) subsagittate at base with sinus to 0.7 cm deep and posterior lobes rounded to subtruncate or (rarely) obtuse, nearly truncate or

rounded to obtuse apically, palmately (5-)7(-9)-nerved, pellucid-gland-dotted on both surfaces, sparsely to moderately hirsute on both sides (especially along major veins abaxially). Inflorescences solitary, basal. Peduncle 1.6-3.7 cm, with hairs like petiole. Spike 7.3-16.1 cm × 0.4-1.0 mm, pinkish. Flowers ± crowded at first, becoming distant; rachis virtually glabrous; bracts 0.4-0.5 mm wide, ± peltate, elliptic, covered with orange, sessile glands; anthers broadly elliptic, ca. 0.2 mm. Fruits ca. 0.5-0.6 × 0.4-0.5 mm, ± globose-bodied, broadly narrowed to substipitate base, beakless; stigma apical.

Additional specimens examined. COSTA RICA. Puntarenas: Cantón de Osa, forest along Quebrada Benjamín, near crossing of trail from Palmar Norte to Jalisco, 8° 58′ N, 83° 28′ W, ca. 160 m, 14 Dec 1989, *Grayum & Hammel 9543* (BM,INB, MO); Cantón de Osa/Buenos Aires, western part of main ridge of Fila Retinto, along and near trail (not on current maps) from Palmar Norte to Jalisco, 8° 59′ 30″ N, 83° 28′ W, ca. 780-960 m, 9 Dec 1988, *Grayum & Herrera 9150* (MO).

Peperomia saintpauliella is apparently confined to a small area to the north and east of Golfo Dulce in Puntarenas Province, from near Palmar Norte to the vicinity of Golfito. Here, it grows near forest creeks, often on vertical rock (usually specified as limestone) faces, at ca. 50-800 m elevation.

Peperomia saintpauliella comprises smallish, acaulescent plants with impeltate, suborbicular leaves and solitary, basal inflorescences. As the specific epithet implies, living specimens bear a strong vegetative resemblance to smaller forms of the cultivated African violet (*Saintpaulia ionantha* H. Wendl.), and have a similarly compact, ornamental appearance. Living material of *P. saintpauliella* is in cultivation at the Missouri Botanical Garden, and plants have been put on display in the Climatron.

Other *Peperomia* species most resembling *P. saintpauliella* are the Colombian *P. macrotricha* C. DC. and the Panamanian *P. umbrigaudens* Yunck. and, especially, *P. insueta* Trel. The last-mentioned species differs from *P saintpauliella* in having longer (4.0-7.5 cm), narrowly elliptic to ± ovate leaf blades, absolutely and relatively much longer peduncles (about as long as the spikes), and generally shorter and thicker spikes (6-12 cm × 1.0-1.5 mm).

PEPEROMIA TRICHOMANOIDES Grayum, *spec. nov.* TYPE: COSTA RICA. Puntarenas: Cantón de Osa, Fila Costeña, Fila Cruces, cabeceras del Río Piedras Blancas, Cerro Anguciana, faldas al Oeste, bosque en roca de cal, 9° 48′ 56″ N, 83° 10′ 37″ W, 1,400-1,600 m, 10 Dec 1993, *Hammel 19273* (HOLOTYPE: INB!; Isotypes: BM!,CR!,MO!).

Differt a *P. saintpauliella* Grayum dimensionibus uniformiter parvioribus pedunculis relative longioribus rhachidi inflorescentiae dense pubescenti; a *P. tuerckheimii* C. DC. laminis foliorum impeltatis basi cordatis relative latioribus venis primariis basalibus plerumque 7.

Plants epilithic, the leaves and spikes flattened against rock. Stems short and thick, subcormose, ca. 0.2-0.8 × 0.15-0.25 cm. Leaves apparently alternate, in basal rosette. Petiole 0.3-1.9 cm, spreading-hirsute with uniseriate hairs. Lamina 0.5-1.8 × 0.5-1.8 cm, broadly ovate to suborbicular or subreniform, impeltate or scarcely peltate, cordulate or cordate at base with sinus to 0.25 cm deep and posterior lobes rounded to subtruncate, broadly rounded to subacute apically, palmately 3-5-nerved, pellucid-gland-dotted at least above, appressed-hirsute on both sides (more sparsely so above). Inflorescences solitary, basal. Peduncle ca. 1.3-4.1 cm, pubescent as petiole. Spike 2.7-7.0 cm × 0.2-0.9 mm. Flowers becoming distant; rachis ± densely spreading-pubescent; bracts 0.3-0.4 mm wide, ± peltate, suborbicular, densely dark-pellucid-punctate; anthers broadly elliptic-oblong to suborbicular, ca. 0.25-0.30 mm. Fruits ca. 0.5-0.6 × 0.3-0.4 mm, ellipsoidal to subglobose, narrowed to substipitate base, beakless; stigma apical.

This species is known only from the type locality, at 1,400-1,600 m elevation on the steep limestone ramparts of Cerro Anguciana, the highest peak in the Fila Costeña of southern Pacific Costa Rica.

Peperomia trichomanoides is so named because its habitat (epilithic and growing among mosses), appressed habit, and small size recall some species of the fern genus *Trichomanes* L. (Hymenophyllaceae). Plants of this species resemble, in general aspect, miniature versions of *P. saintpauliella* (described above), from which they differ not only in their uniformly smaller dimensions, but also in having proportionately longer (relative to the spike) peduncles and densely pubescent (rather than essentially glabrous) inflorescence rachises. In the latter respect, *P. trichomanoides* approaches some specimens of *P. tuerckheimii* C. DC. (including *P. hispidorhachis* Yunck. and *P. tecticola* C. DC.), another small calciphile that occurs in the same vicinity; however, *P. tuerckheimii* has clearly peltate, non-cordate, more elongate leaf-blades with generally 7 (rather than 5) primary basal veins.

PEPEROMIA URSINA Grayum, *spec. nov.* TYPE: COSTA RICA. Limón: Cordillera de Talamanca, along ridge descending to main fork of Quebrada Cañabral from divide between basin of Río Madre de Dios and that of Río Barbilla, 10° 02′ N, 83° 25′ W, 280-400 m, 6 Sep 1988, *Grayum, Herrera, & Robles 8842* (HOLOTYPE: INB!; Isotypes: BM!,COL!,F!,MO!).

Differt a *P. alata* Ruiz & Pav. pubescentia dense uniformiterque hirsuta; a *P. tuisana* C. DC. atque *P. montecristana* Trel. petiolis brevioribus inflorescentiis multo brevioribus.

Appressed-climbing trunk epiphytes or epilithic, stoloniferous. Stems erect to ± decumbent, ca. 2-8 × 0.10-0.15 cm, spreading-hirsute with uniseriate hairs. Leaves alternate. Petiole 0.1-0.3 cm, pubescent as stems. Lower leaves ± reduced; medial and distal laminae 1.0-3.6 × 0.5-1.5 cm, narrowly elliptic to rhombic, impeltate, acute at base, subacute to subacuminate at apex, ± obscurely 3-nerved from base, hirsute on both surfaces. Inflorescences solitary at stem apex. Peduncle 0.1-1.0 cm, spreading-

hirsute. Spike 1.3-5.0 cm × 0.7-1.5 mm, yellow-green. Flowers moderately separated; rachis glabrous; bracts 0.3-0.4 mm wide, suborbicular, densely glandular-punctate; anthers broadly elliptic, 0.15-0.25 mm. Fruits ca. 0.5-0.6 × 0.5-0.6 mm, globose-bodied, rounded at base, exserted on triangular stipe ca. 0.5-0.6 mm, papillate, with stout, conical beak to ca. 0.15 mm.

Additional specimens examined. COSTA RICA. Limón: Reserva Indígena Talamanca, camino a Soki entre la Quebrada Amubri, margen izquierda de Río Lari, 9° 29′ 40″ N, 82° 59′ 40″ W, 200 m, 28 Jun 1989, *A. Chacón 20* (BM,CR,MO).

As far as is presently known, *Peperomia ursina* is restricte to the Atlantic slope of the Costa Rican Cordillera de Talamanca from ca. 200-400 m. According to collectors' notes, the plants may be either epilithic or epiphytic on trunks.

Peperomia ursina is most similar and perhaps most closely related to *P. alata* Ruiz & Pav. and allied species characterized by alternate, distichous leaves with thin, palmately veined blades, and solitary inflorescences. It differs sharply from most species in this group in its dense, uniform hirsute pubescence, reflected in the specific epithet. This species will key to the vicinity of *P. tuisana* C. DC. and *P. montecristana* Trel. in Burger's (1971) treatment of Costa Rican Piperaceae, but differs from both in its shorter petioles and much shorter inflorescences.

ACKNOWLEDGMENTS

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NEW ADDITIONS TO THE GENUS *PINGUICULA* (LENTIBULARIACEAE) OF MEXICO

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ABSTRACT

Two new species of *Pinguicula* from México are described and illustrated: ***P. stolonifera*** (subgen. *Pinguicula*) from the state of Oaxaca, and ***P. laxifolia*** (subgen. *Pinguicula*) from the state of Tamaulipas. *Pinguicula stolonifera* belongs to the section *Orcheosanthus*, and subsect. *Caudatopsis*. A new section (***Orchidioides***) is proposed to include *P. laxifolia*. The taxonomic status of *P. jorgehintonii* B.L. Turner, *P. hintoniorum* B.L. Turner, and *P. reticulata* Schlauer is discussed. They are considered to be synonymous with previously described species.

KEY WORDS: Lentibulariaceae, *Pinguicula*, Flora of México, systematics

Research on the extensive herbarium collections of the genus *Pinguicula*, from the University of Texas, has revealed the following results.

Pinguicula stolonifera Luhrs, *spec. nov.* (Figure 1). TYPE: MEXICO. Oaxaca: ca. 3 km. se. of Ixtlán de Juárez, on steep banks in pine and oak woods, ca. 2300-2400 m, 14 Aug. 1966, *R.W. Cruden 1177* (HOLOTYPE: TEX! 271238); sub nomine *P. oblongiloba* DC. Det.: S. Zamudio 1989.

Herba perennis, stolonifera; stolones flagelliformis, cerasini, usque ad 8 cm longis. Rhizoma simplex brevis, radicibus adventitiis numerosis funiformibus. Folia radicalia rosulata, biformia; rosula "hiemis" numerosa - 36, crassa, ovata vel lanceolata, acuta, 4-7(-12) mm longa, 1-3 mm lata, facie concava; rosula "aestatis" 4-7, distincte petiolata, petiolo erecto, 11-18 mm longo, 2-3 mm lato, margine ciliato, lamina lanceolata vel anguste oblongo-ovata, acuta, basin versus angustata, margine provunde involuta, superne glandulis sessilibus et glandulis stipitatis dense vestita, 18-33 mm longa, 6-12 mm lata. Hibernacula nulla; gemmatae. Pedicelli 1-3 erecti, cerasini, apicem versus glandulis stipitatis disperse obsiti, 105-164 mm alti, uniflori. Flores 39-51 mm longi (calcari incluso). Calyx bilabiatus, extus glandulis stipitatis

obsitus; labium superum trilobum, lobis anguste ovatis, 3 mm longis, 2 mm latis; labium inferum usque ad dimidium longitudinis bilobum, lobis ovatis, 2.5 mm longis, 1 mm latis. Corolla ringens, profunde bilabiata, magentea, labio infero ad basi striata alba ornato, extus glandulis stipitatis vestita; labium superum bilobum, lobis oblongo-ovatis, 10-14 mm longis, 5-9 mm latis; labium inferum profunde tripartitum, lobis lateralibus oblongo-lanceolatis, apicem versus angustatis, 11-16 mm longis, 4-7 mm latis, lobo intermedio paulo major 15-19 mm longo, 4-5 mm lato. Tubus brevissimus infundibuliformis, 3-4 mm longus, intus pilosus, pilis cylindrico-subulatis, sine palato. Calcar cylindrico-acuminatum, sinuatum, 18-26 mm longum, cerasinum. Ovarium subglobosum, glandulis stipitatis obsitum. Stigma bilabiatum, purpureum, labio infero maximo, suborbiculato, fimbriato. Capsula ovoidea, ± 4 mm longa, glandulis stipitatis parum obsita. Florescentia VIII-IX.

Perennial herb, stoloniferous; stolons whip-like, cherry-red, up to 8 cm long, bearing up to 4 non glandular leaves (2-4[-6] mm long) along its length. Stem short, with numerous adventitious fibrous roots. Leaves rosulate, dimorphic; the leaves of the winter rosette numerous -36, thick, ovate or lanceolate, acute, 4-7(-12) mm long, 1-3 mm wide, concave; the leaves of the summer rosette 4-7, with a distinct petiole, erect, 11-18 mm long, 2-3 mm wide, margin ciliate, lamina lanceolate or narrowly oblong-ovate, acute, narrowing towards the base, margin deeply involute, the upper surface densely covered with sessile and stipitate glands, 18-33 mm long, 6-12 mm wide. Hibernaculum absent; provided with gemma-like buds. Scapes 1-3, erect, cherry-red, the upper part dispersedly stipitate glandular, 105-164 mm tall, 1-flowered. Flowers 39-51 mm long, including the spur. Calyx bilabiate, stipitate glandular; upper lip 3-lobed, the lobes narrowly ovate, 3 mm long, 2 mm wide; lower lip divided to the middle into 2 lobes, the lobes ovate, 2.5 mm long, 1 mm wide. Corolla deeply bilabiate, red-purple, the base of the lower lip marked with a white vertical streak, the outer surface stipitate glandular; upper lip 2-lobed, the lobes oblong-ovate, 10-14 mm long, 5-9 mm wide; lower lip deeply 3-lobed, the lateral lobes oblong-lanceolate, narrowing towards the apex, 11-16 mm long, 4-7 mm wide, the middle lobe slightly larger, 15-19 mm long, 4-5 mm wide. Tube extremely short, funnel-shaped, 3-4 mm long, with cylindrical-subulate hairs inside, palate absent. Spur cylindrical-acuminate, 18-26 mm long, cherry-red. Ovary subglobular, stipitate glandular. Stigma bilabiate, purple, the lower lip much larger, suborbiculate, margin fimbriate. Capsule ovoid, ± 4 mm long, slightly stipitate glandular. Florescence August-September.

ADDITIONAL MATERIAL EXAMINED: MEXICO. Oaxaca: Distr. Ixtlán, Sierra de Juárez, ne. of C. Pelón, on a steep loamy bank, ± 2700 m, 29 Sep. 1991, *Luhrs et al. 9105* (Herb. Luhrs); In umbrosis Totontepeque, *Hartweg 509* (L).

Pinguicula stolonifera belongs to the section *Orcheosanthus* because of the deeply bilabiate corolla, the extremely short funnel-shaped tube, and the very large spur. Within this it is placed in the subsect. *Caudatopsis*, together with *P. macrophylla* H.B.K. and *P. oblongiloba* DC., because of the lanceolate or broadly ovate, acute or acuminate winter leaves, and long petiolate summer leaves as defined in Casper's monograph of the genus *Pinguicula* (1966a). It shows some affinity with *P.*

oblongiloba, especially on behalf of the corolla lobes (*Hinton et al. 14504* [TEX]). Although it has been identified with *P. oblongiloba* by S. Zamudio, it differs from the latter by having much shorter, narrower, and deeply involute summer leaves, and by forming gemma-like buds, putting forth long whip-like runners, budding at the end of its tip, a feature which is unique in the Mexican pinguiculas and is known (in a much shorter stolon-like manner in *P. calyptrata* H.B.K. from Ecuador, and *P. vallisneriifolia* Webb from Spain. Unfortunately these differences are not easily observed when the plants are dried, resulting in difficult identification of the herbarium material, especially when plants are poorly pressed. However, field study confirms such identification, as both species have been observed by the author in their natural habitats. Other characteristics are:

	P. stolonifera	*P. oblongiloba*
Winter leaf	ovate or lanceolate, acute, 4-7(-12) mm L./ 1-3 mm W.	lanceolate, acute, 8-12 (-15) mm L./. 2-3(-5) mm W.
Lamina of the summer leaf	lanceolate or narrow, ovate-oblong, acute, 18-33 mm L./ 6-12 mm W.	oblong or spatulate-rotundate, 23-65 mm L./ 10-42 mm W.
Petiole	11-18 mm L.	12-23 mm L.
Scape	apex dispersedly stipitate glandular, 105-164 mm L.	densely stipitate glandular, (60-)80-130(-154) mm L.
Corolla	red-purple	purple-violet
Inferior lobes	oblong-lanceolate 11-19 mm L./ 4-7 mm W.	oblong-lanceolate or oblong-obovate, 9-13 mm L./5-8 mm W.
Spur	sinuate, 18-26 mm L.	incurved, (13-)18-23(-26) mm L.

Pinguicula stolonifera is known from the southern slopes of the Sierra de Juárez, Oaxaca, where it inhabits cool and moist banks in mixed oak and pine woods at altitudes between 2300 and 2700 m.

Pinguicula laxifolia Luhrs, *spec. nov.* (Figure 2). TYPE: MEXICO. Tamaulipas: Distr. Gómez Farías, Rancho del Cielo, between La Perra and Agua Linda, small plants with pink flowers, 31 Mar 1969, *A. Richardson 1211* (HOLOTYPE: TEX!).

Herba perennis. Rhizoma simplex brevis, radicibus adventitiis filiformibus numerosis. Folia radicalia rosulata, biformia; rosula "hiemis" numerosa -17, obovato-spathulata, subpetiolata, 10-17 mm longa, 1.5-3.5(-5.0) mm lata; rosula "aestatis" semierecta, erecto-patens dissimilia, elliptica vel oblanceolata, basin versus in longe petiolum ad ± 1/3 longitudinis angustata, apicem versus margine parum involuta, superne glandulis sessilibus et

glandulis stipitatis dense vestita, (32-)40-68 mm longa, (4-)6-12 mm lata. Hibernacula nulla. Pedicelli 1-3 (vel plures?) erecti, glandulis stipitatis obsiti, 60-93 mm alti, uniflori. Flores 30-39 mm longi (calcari incluso). Calyx bilabiatus, extus glandulis stipitatis obsitus; labium superum trilobum, lobis oblongis, ± 2 mm longis, 1.5 mm latis; labium inferum bilobum, lobis elliptico-oblongis, ± 1 mm longis, 1 mm latis. Corolla bilabiata, rosea vel pallide violacea, in fauce albida, stria et macula violacea; labium superum bilobum, lobis late obovato-cuneatis, 8-9 mm longis, 6-8 mm latis; labium inferum trilobum, basi pilosis luteus, pilis longis cylindricis disperse vestitis, lobis lateralibus obovatis vel obovato rotundatis, 9-10 mm longis, 7-9 mm latis, lobo intermedio obovato vel suborbiculato, usque ad 13 mm longo et 11 mm lato. Tubus brevis, late infundibuliformis, 6-8 mm longus, 4-5 mm latus, sine palato, intus pilosus, pilis longis cylindricis disperse vestitus. Calcar cylindricum-acuminatum, subrectum, 10-14(-17) mm longum, cum tubo angulum subrectum formans. Capsula subglobosa, ± 3 mm longa. Florescentia (II)-III-(?).

Perennial herb. Stem short, with numerous adventitious thread-like roots. Leaves rosulate, dimorphic; the leaves of the winter rosette numerous -17, obovate-spatulate, subpetiolate, 10-17 mm long, 1.5-3.5(-5.0) mm wide; the leaves of the summer rosette semi-erect, spreading at different angles, elliptic or oblanceolate, narrowing towards the base into a long petiole about 1/3 of its length, the margin towards the apex lightly involute, the upper surface densely covered with sessile and stipitate glands, (32-)40-68 mm long, (4-)6-12 mm wide. Hibernaculum absent. Scapes 1-3 (or more?), erect, stipitate glandular, 60-93 mm tall, 1-flowered. Flowers 30-39 mm long, including the spur. Calyx bilabiate, stipitate glandular; upper lip 3-lobed, the lobes oblong, ± 2 mm long, 1.5 mm wide; lower lip 2-lobed, the lobes elliptic-oblong, ± 1 mm long, 1 mm wide. Corolla bilabiate, pink or pale violet, the throat white, with darker violet markings; upper lip 2-lobed, the lobes broadly obovate-cuneate, 8-9 mm long, 6-8 mm wide; lower lip 3-lobed, the base dispersedly scattered with long cylindrical hairs, being yellow in the center of the throat, the lateral lobes obovate or obovate-rotundate, 9-10 mm long, 7-9 mm wide, the middle lobe obovate or suborbiculate, up to 13 mm long and 11 mm wide. Tube short, broadly funnel-shaped, 6-8 mm long, 4-5 mm wide, palate absent, the inside scattered with long cylindrical hairs. Spur cylindrical-acuminate, more or less straight, 10-14(-17) mm long, forming an almost straight angle with the tube. Capsule subglobular, ± 3 mm long. Florescence (February)-March-(?)

This species occurs between 6300 and 6800 ft. in the high mountains of the Gómez Farías area. Although the distribution of this plant appears to be very restricted, further details of habitat and geographical range are unknown.

Pinguicula laxifolia clearly belongs to the subgen. *Pinguicula* because of its bilabiate corolla, distinct funnel-shaped tube, and the spur which is longer than the tube without being contracted from it. Within this it is closely related to the sections *Orcheosanthus* and *Pinguicula*. From the latter it is distinguished because of the dimorphic leaves, the absence of a hibernaculum, and the somewhat larger tube. From the section *Orcheosanthus* it is distinguished because of the bilabiate corolla, the

lobes being almost twice as long as the tube, and the spur formed in an almost straight angle with the tube about twice its length.

The existence of this new species, which cannot satisfactorily be placed in either of the sections mentioned above, necessitates the erection of a new section within the subgen. *Pinguicula*, named after the likeness with members of the Orchid family, and close relationship to the section *Orcheosanthus*.

Pinguicula sectio ***Orchidioides*** Luhrs, *sect. nov.*

> Folia biformia, hibernaculis nullis; corolla bilabiata, lobis tubum ± duplo superantibus; tubus brevis, late infundibuliformis; calcar longiusculus, tubum ± duplo superans.

Leaves dimorphic, without hibernaculum; corolla bilabiate, the lobes about twice the length of the tube; tube short, broadly funnel-shaped; spur moderately long, about twice the length of the tube.

Type species: *Pinguicula laxifolia* Luhrs.

In view of the fact that most species of *Pinguicula* show a degree of variation in size, figure, and color of the floral parts, the following species, due to their close resemblance to previously described taxa, are considered to be synonymous.

Pinguicula jorgehintonii B.L. Turner and *P. hintoniorum* B.L. Turner (Turner 1994), were thought to be related to *P. esseriana* Kirchner of the section *Crassifolia*. *Pinguicula jorgehintonii* is clearly related to the section *Heterophyllum*, because of the corolla with equal lobes, the cylindrical tube, and the short spur being well contracted from the tube. Within this it shows identical features with *P. rotundiflora* Studnicka (1985) of the subsect. *Isolobopsis*. According to the description and the herbarium specimens accompanied by numerous photographs (*Hinton et al. 24000* [HOLOTYPE: TEX]), the two types of leaves described are actually decayed late-summer leaves, and those who form the winter rosette of which the plant flowers. These are identical with the leaves of *P. rotundiflora* which flowers at the same time. The numerous capitate hairs on the orifice of the throat and inside the tube occur in both species. Because of the identical features alluded to, *P. jorgehintonii* is regarded as a synonym of *P. rotundiflora*. The obvious resemblances of the inflorescence of both species are found in Table 1.

Pinguicula hintoniorum is related to *P. esseriana* and belongs to the section *Crassifolia*, mainly because of the numerous succulent leaves, forming a tight rosette like those of a *Sempervivum*, a feature which cannot be observed in dried material. According to the herbarium specimens and the photographs accompanied (*Hinton et al. 22661* [HOLOTYPE: TEX]), it is clearly identical to *P. ehlersae* Speta & Fuchs (1982), a species which has been observed by the author both in the field and in culture. *Pinguicula hintoniorum* is regarded as synonymous with *P. ehlersae*, because of the oblanceolate or spatulate winter leaves, the nearly glabrous scapes, the deeply bilabiate corolla, purple or mauve in color, the narrowly cuneate or obovate corolla lobes, the short funnel-shaped tube, and the long glabrous spur.

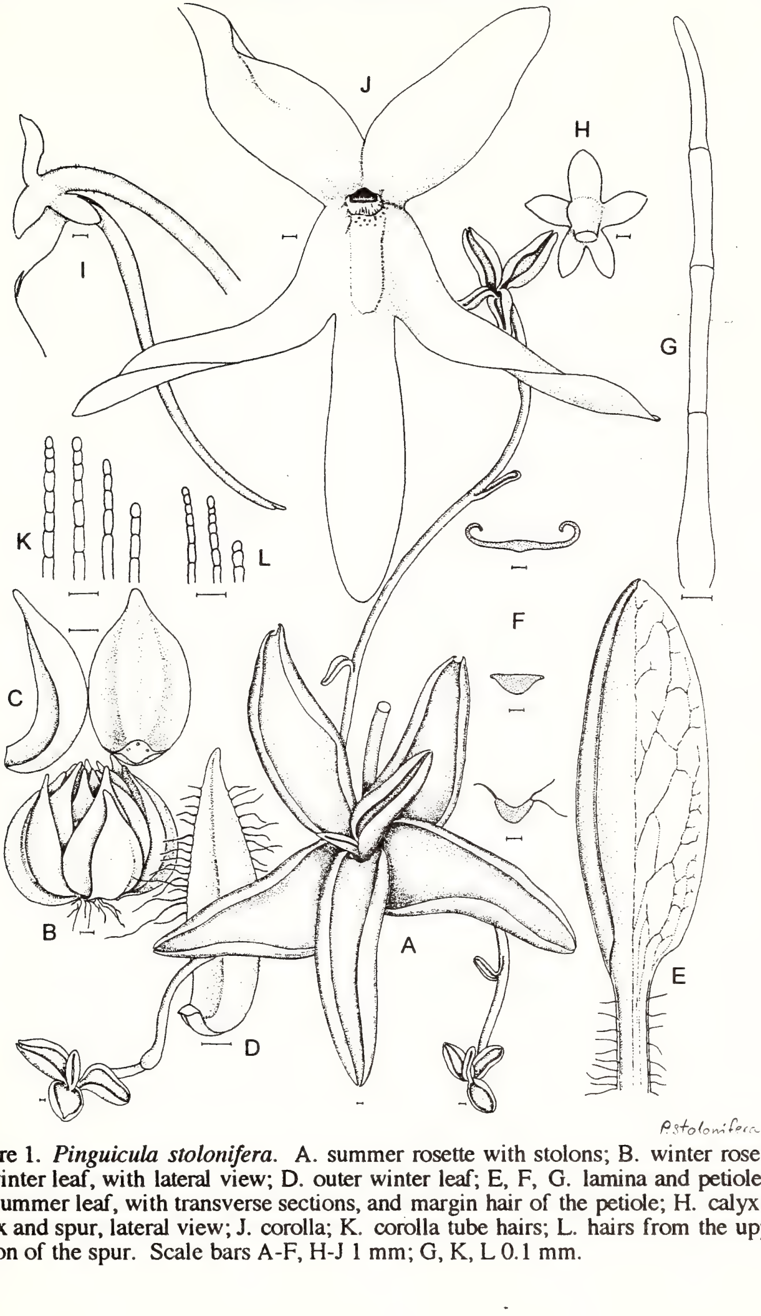
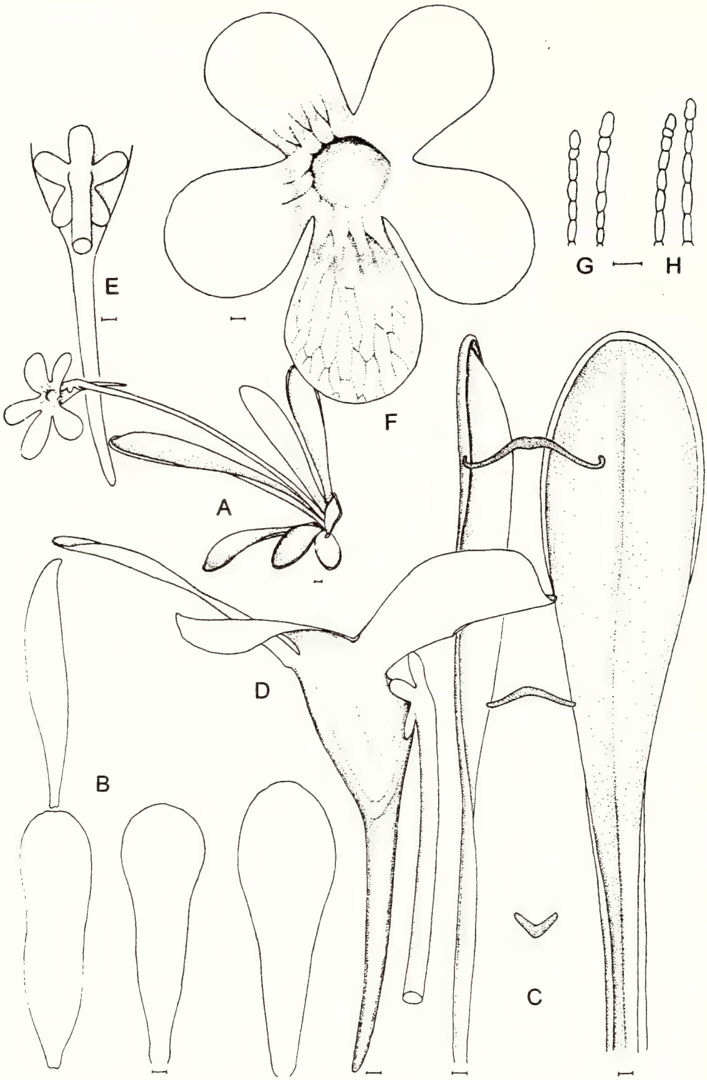


Figure 1. *Pinguicula stolonifera*. A. summer rosette with stolons; B. winter rosette; C. winter leaf, with lateral view; D. outer winter leaf; E, F, G. lamina and petiole of the summer leaf, with transverse sections, and margin hair of the petiole; H. calyx; I. calyx and spur, lateral view; J. corolla; K. corolla tube hairs; L. hairs from the upper region of the spur. Scale bars A-F, H-J 1 mm; G, K, L 0.1 mm.



P. laxifolia

Figure 2. *Pinguicula laxifolia*. A. flowering plant; B. winter leaves, with lateral view; C. summer leaf, with lateral view, and transverse sections; D. flower, lateral view; E. calyx and spur; F. corolla; G. corolla throat hairs; H. corolla tube hairs. Scale bars A-F 1 mm; G, H 0.1 mm.

Table 1. Comparison of inflorescence features between *Pinguicula jorgehintonii* and *P. rotundifolia*.

	P jorgehintonii	*P. rotundiflora*
Scape	glabrous, 30-60 mm L.	glabrous, 20-75 mm L.
Corolla lobes	pink or pale purple, obovate or cuneate, 5-8 mm L./ 5-8 mm W.	pale purple, obovate, oblong or cuneate, 5-9 mm L./ 4-9 mm W.
Tube	cylindrical, ± 8 mm L./ 6 mm W.	cylindrical, 5-9 mm L./ 4-7 mm W.
Spur	short, 5-8 mm L.	short, 4-7 mm L.

Another species, *Pinguicula reticulata* Schlauer (1991), shows a remarkable resemblance with *P. kondoi* Casper (1974), both belonging to the section *Heterophyllum* and subsect. *Isolobopsis*. *Pinguicula reticulata* was thought to be different from *P. kondoi* because of the longer flower scapes, the truncate or somewhat emarginate calyx lobes, and the purple-veined corolla lobes. From habit observations, the average length of the flower scapes is equal to those of *P. kondoi*, the calyx lobes are not always truncate or emarginate but also obtuse, and the veining of the corolla lobes is not always visible, in white as well as in pale purple corollas. Herbarium specimens of *P. reticulata* (*Hinton et al 21936, 22700, 22716* [TEX]) show similar features with those of *P. kondoi* (*Hinton et al. 19021* [TEX]), and according to the latter's description, the photograph of the holotype (*Kondo 1029* [NCU 381921]) clearly indicates dark venation in the corolla lobes, a feature that somehow must have been overlooked by the author. The most obvious resemblances of the inflorescence are:

	P. reticulata	*P. kondoi*
Scape	stipitate glandular, 30-65 (-90) mm L.	stipitate glandular, 30-65 mm L.
Calyx lobes	oblong or oblong-spatulate, truncate, emarginate or obtuse	oblong-spatulate, obtuse
Corolla lobes	suborbiculate, rotundate, 4-5 mm L./ 4-5 mm W.	suborbiculate, rotundate, 4-5 mm L./ 4-5 mm W.
Tube	8 mm L./ 3-4 mm W.	8 mm L./ 3-4 mm W.
Spur	± 4 mm L.	3.5-4.5 mm L.

Despite its name, *Pinguicula reticulata* must be regarded as a synonym of *P. kondoi*, due to the identical features discussed.

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FLORISTICS OF XERIC SANDHILLS IN NORTHWESTERN LOUISIANA

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ABSTRACT

The floristics and edaphic conditions of three northwestern Louisiana xeric sandhills are described. This community occurs in central and northwestern Louisiana, east Texas, and southern Arkansas. The soil is nutrient poor and porous. Water and air move rapidly through it, causing rapid drying. In presettlement times, xeric sandhills were probably fairly common in northwestern Louisiana, but because of fire suppression, grazing, agriculture, oil exploration, and agroforestry, this community has been almost eradicated and is now considered imperiled.

KEY WORDS: Sandylands, xeric sandhills, floristics, Louisiana

INTRODUCTION

As is the case for so many plant communities of the West Gulf Coastal Plain, there is little published information on xeric sandhills (synonyms: sandylands, oak-farkleberry sandylands, xeric sandy woodlands) (see MacRoberts & MacRoberts 1994 for literature). This community occurs in east Texas, central and northwestern Louisiana, and in southern Arkansas. The xeric sandhills of the West Gulf Coastal Plain appear to be similar to turkey oak sandhill forests in the East Gulf Coastal Plain except for the absence of several key species such as turkey oak (*Quercus laevis* Walt.) and wiregrass (*Aristida stricta* Michx.) and the presence of several western elements not found in the east (Harcombe *et al.* in press; Stout & Marion 1993).

Xeric sandhills occur mainly in Tertiary marine deposits on ridge tops and upper slopes, and on Pleistocene deposits on terraces near streams. The deep sandy soils are of low fertility and, because of their porous nature, water and air move rapidly through them causing rapid drying. Overstory, midstory, and herbaceous vegetation is often sparse allowing sun to reach the ground, and in some areas, trees are virtually absent. Reflected glare from the sand is often intense. Trees, typically a combination of overstory pines and midstory oaks, are often stunted. Lichens and mosses are

usually plentiful on the bare soils, and the soils, where undisturbed, are often cryptogamic.

In order to learn more about this community, we made a study of the vascular flora of three xeric sandhills in Caddo Parish in northwestern Louisiana. In addition we made brief and irregular surveys of other sandhills in Caddo Parish to assess their condition and to look for rare species. Many of these sites are known because of rare species records: others were located through soil maps.

METHODS

We visited three xeric sandhills --- Ida, Kendrick Road, and Roger's Station --- every two to three weeks between the summer of 1994 and the fall of 1995. The three sites are located in T23N R15W Sec. 26, T22N R16W Sec. 11, T21N R16W Sec. 5, respectively, and are within 20 km of each other. The three sites are on private land.

All of the study areas are partly open (10% - 50% cover), the overstory dominated by *Quercus incana* Bartr., *Q. marilandica* Muenchh., *Q. stellata* Wang., and *Pinus taeda* L. Trees are often stunted and small openings occur among the wooded areas. Ida and Roger's Station are each about 1.2 ha. in size while Kendrick Road is only about 0.4 ha. All are about 90 meters above sea level.

The three study sites, although selected because of their relatively good condition, are badly damaged. Roger's Station is an oil field with active wells, pipelines, and storage tanks. It is also the site of earlier sand excavations that left large pits --- some excavated for sand, others as mud pits and for waste water --- now ponds. Ida has some oil/gas pipelines, and storage tanks. It is also the site of earlier sand excavations that left large pits ---some excavated for sand, others as mud pits and for waste water --- now ponds. Ida has some oil/gas pipelines through it but damage here is mainly the result of agribusiness, roads, herbicides, and fire suppression. Half of Kendrick Road is mowed annually; the remainder is a tangle of shrubs with little or no herbaceous layer. There is little or nothing "natural" about the processes keeping these sites open. Compared with the sites in Natchitoches Parish (MacRoberts & MacRoberts 1994), they are weedy with often a very dense cover of such species as *Cassia, Krigia, Ambrosia, Plantago, Oenothera, Rubus, Gnaphalium, Diodia*, and *Daucus*.

We collected and recorded all vascular plants found. Additionally, we consulted the herbarium at Louisiana State University in Shreveport [LSUS], which has a substantial collection of plants from Ida made by D.T. MacRoberts in the late 1970's (MacRoberts 1979). We follow Kartesz (1994) in most instances of botanical nomenclature. Voucher specimens of many of the species collected are deposited at VDB, LSUS, and LSU.

Soil samples were taken from the upper 15 cm of each sandhill community and analyzed by A&L Laboratories, Memphis, Tennessee.

While the specific fire history of these areas is not known, none has burned in decades. It can be inferred that in presettlement times the sites probably burned regularly since xeric sandhills are continuous with the oak-pine communities surrounding them.

We also made irregular observations of other sandhill sites in Caddo Parish, several of which are known because of the presence of state rare plants. Further sites were located using soil survey maps. We assessed the condition of these areas and looked for rare species. All are badly damaged by various anthropogenic activities.

Annual precipitation averages about 100 cm and is fairly evenly distributed throughout the year. In summer, temperatures rise to 35° C, which, combined with short droughts, translates into very hot and dry conditions. Under these conditions, especially when there are short droughts, the exposed sands become very dry. Drought occurred in August 1995, which may have prevented or delayed flowering in some of the grasses (Edwards *et al.* 1980).

General background information on geology, soils, climate, and plant communities in Caddo Parish can be found in MacRoberts (1979), Edwards *et al.* (1980), and Teague & Wendt (1994).

RESULTS

We list the vascular plants found at Ida (I), Kendrick Road (K), and Roger's Station (R) in Table 1. If the species occurs at all three sites, we give no site location.

We recorded 170 taxa, representing 139 genera and 60 families for the three xeric sandhill sites. Asteraceae, Fabaceae, and Poaceae are the dominant families, accounting for about 36% of the total species. Ida had 143 taxa, Kendrick Road had 118, and Roger's Station had 139. Sorensen's Index of Similarity (IS) shows the three sites to be essentially the same community: Ida/Kendrick Road IS = 76, Ida/Roger's Station IS = 80, and Roger's Station/Kendrick Road IS = 83.

We list the soil characteristics of the three Caddo Parish sandhills in Table 2.

The soil on which this community occurs is acidic loamy fine sand of low fertility and rapid permeability (Edwards *et al.* 1980) and belongs to the same soil series described previously for Natchitoches Parish xeric sandhills (MacRoberts & MacRoberts 1994).

Table 1. Vascular plants at three xeric sandhills in Caddo Parish.

ACANTHACEAE - *Ruellia humilis* Nutt. [K,R].
AGAVACEAE - *Yucca louisianensis* Trel.
AMARANTHACEAE - *Froelichia floridana* (Nutt.) Moq.
ANACARDIACEAE - *Rhus aromatica* Ait., *R. copallina* L., *Toxicodendron radicans* (L.) Kuntze.
ANNONACEAE - *Asimina parviflora* (Michx.) Duval.
APIACEAE - *Daucus pusillus* Michx., *Spermolepis echinata* (DC.) Heller.
AQUIFOLIACEAE - *Ilex decidua* Walt. [K,R], *I. vomitoria* Ait. [I,K].
ASCLEPIADACEAE - *Asclepias amplexicaulis* Sm. [I,R], *A. tuberosa* L. [I,R], *Matelea cynanchoides* (Engelm.) Wood [K,R].
ASTERACEAE - *Ambrosia artemisiifolia* L., *Aster patens* Ait. [R], *Berlandiera pumila* (Michx.) Nutt., *Conyza canadensis* (L.) Cronq. [I,R], *Coreopsis intermedia* Sherff [K,R], *Coreopsis lanceolata* L., *Croptilon divaricatum* (Nutt.) Raf., *Erigeron strigosus* Willd., *Gaillardia aestivalis* (Walt.) Rock., *Gnaphalium obtusifolium* L. [I,R], *Gnaphalium purpureum* L., *Heterotheca pilosa* (Nutt.) Shinners, *Heterotheca subaxillaris* (Lam.) Britt. & Rusby [K,R], *Hieracium gronovii* L. [I], *Hymenopappus artemisiaefolius* DC., *Lactuca canadensis* L., *Liatris elegans* (Walt.) Michx., *Krigia virginica* (L.) Willd., *Rudbeckia hirta* L., *Solidago ludoviciana* (A. Gray) Small, *Tetragonotheca ludoviciana* (Torrey & A. Gray) A. Gray [I,R], *Vernonia texana* (A. Gray) Small [R].
BORAGINACEAE - *Lithospermum caroliniense* (J.F. Gmel.) MacM.
BRASSICACEAE - *Draba brachycarpa* Nutt. *ex* Torrey & A. Gray [I], *Streptanthus hyacinthoides* Hook. [K,R], *Thlaspi arvense* L.
CACTACEAE - *Opuntia humifusa* (Raf.) Raf.
CAMPANULACEAE - *Trifolium perfoliata* (L.) Nieuwl.
CAPRIFOLIACEAE - *Viburnum rufidulum* Raf. [I,R].
CARYOPHYLLACEAE - *Arenaria serpyllifolia* L. [K], *Paronychia drummondii* Torrey & A. Gray [R].
CISTACEAE - *Helianthemum georgianum* Chapm., *Lechea mucronata* Raf.
CLUSIACEAE - *Hypericum gentianoides* (L.) B.S.P., *H. hypericoides* (L.) Crantz.
COMMELINACEAE - *Commelina erecta* L., *Tradescantia reverchonii* Bush.
CONVOLVULACEAE - *Ipomoea pandurata* (L.) Mey. [I], *Stylisma pickeringii* (Torrey *ex* Curtis) A. Gray.
CORNACEAE - *Cornus florida* L.
CUPRESSACEAE - *Juniperus virginiana* L.[I,K].
CYPERACEAE - *Bulbostylis ciliatifolia* (Ell.) Fern. [I,R], *Cyperus retrofractus* (L.) Torrey [I], *C. retroflexus* Buckl., *Rhynchospora grayi* Knunth [I,K], *Scleria triglomerata* Michx. [I].
EBENACEAE - Diospyros virginiana L.
ERICACEAE - *Monotropa uniflora* L. [I], *Vaccinium arboreum* Marsh., *V. stamineum* L. [I,R].
EUPHORBIACEAE - *Cnidosculus stimulosus* (Michx.) Engelm. & A. Gray, *Chamaesyce cordifolia* (Ell.) Small, *Crotonopsis linearis* Michx. [K,R], *Stillingia sylvatica* L., *Tragia urticifolia* Michx. [I,R].

Table 1. (continued).

FABACEAE - *Astragalus leptocarpus* Torrey & A. Gray, *Baptisia nuttalliana* Small [R], *Cassia fasciculata* Michx., *Centrosema virginianum* (L.) Benth., *Crotalaria sagittalis* L. [I], *Dalea villosa* (Nutt.) Sprengel var. *grisea* (Torrey & A. Gray) Barneby [I,K], *Dalea phleoides* (Torrey & A. Gray) Shinners, *Desmodium sessilifolium* (Torrey) Torrey & A. Gray, *Erythrina herbacea* L. [I], *Galactia volubilis* (L.) Britton, *Lespedeza stuevei* Nutt. [I,R], *Pediomelum hypogaeum* (Nutt. *ex* Torrey & A. Gray) Rydb. var. *subulatum* (Bush) J. Grimes [K], *Stylosanthes biflora* (L.) B.S.P., *Tephrosia virginiana* (L.) Pers. [R], *Trifolium arvense* L. [I], *Zornea bracteata* (Walt.) J.F. Gmel.

FAGACEAE - *Quercus falcata* Michx. [I], *Q. incana* Bartr., *Q. marilandica* Muenchh., *Q. stellata* Wang., *Castanea pumila* (L.) P. Mill. [I].

HIPPOCASTANACEAE - *Aesculus pavia* L.

HYDROPHYLLACEAE - *Phacelia strictiflora* (Engelm. & A. Gray) A. Gray [K,R].

GERANIACEAE - *Geranium carolinianum* L.

JUGLANDACEAE - *Carya tomentosa* (Poir.) Nutt., *Juglans nigra* L. [R].

JUNCACEAE - *Juncus marginatus* Rostk. [K,R].

LAMIACEAE - *Hedeoma hispidum* Pursh, *Monarda punctata* L., *Salvia azurea* Michx. & Lam. [I], *Scutellaria cardiophylla* Engelm. & A. Gray, *Teucrium canadense* L. [I], *Trichostema dichotomum* L. [K,R].

LAURACEAE - *Sassafras albidum* (Nutt.) Nees.

LILIACEAE - *Smilax glauca* Walt., *S. smallii* Morong.

LOGANIACEAE - *Gelsemium sempervirens* (L.) St. Hil. [I,R].

NYCTAGINACEAE - *Mirabilis albida* (Walt.) Heimerl.

OLEACEAE - *Chionanthus virginicus* L.

ONAGRACEAE - *Gaura sinuata* Ser. [I,R], *Oenothera biennis* L. [I,R], *O. laciniata* Hill.

OXALIDACEAE - Oxalis stricta L. [I,R].

PINACEAE - *Pinus echinata* P. Mill., *P. taeda* L.

PLANTAGINACEAE - *Plantago aristata* Michx., *P. hookeriana* Fisch. & Mey., *P. virginica* L. [I,R].

POACEAE - *Aristida desmantha* Trin. & Rupr. [K,R], *A. lanosa* Ell., *A. oligantha* Michx., *A. purpurascens* Poir. [I,R], *Cenchrus incertus* M.A. Curtis, *Dichanthelium oligosanthes* (Schult.) Gould, *D. villosissimum* (Nash) Freckman [I], *Eragrostis hirsuta* (Michx.) Nees [I,R], *Eragrostis secundiflora* Presl. [I], *Eragrostis spectabilis* (Pursh) Steud. [R], *Eragrostis trichodes* (Nutt.) Wood [R], *Erianthus alopecuroides* (L.) Ell. [I], *Gymnopogon ambiguus* (Michx.) B.S.P., *Leptoloma cognatum* (Schult.) Chase, *Paspalum setaceum* Michx., *Schizachyrium scoparium* (Michx.) Nash [I,R], *Sorghastrum elliottii* (Mohr) Nash [I], *Sphenopholis obtusata* (Michx.) Scribn. [I,K], *Tridens flavus* (L.) Hitchcock, *Triplasis purpurea* (Walt.) Chapm., *Vulpia octoflora* (Walt.) Rydb., *V. sciurea* (Nutt.) Henr.

POLYGALACEAE - *Polygala polygama* Walt.. [R].

POLYGONACEAE - *Eriogonum longifolium* Nutt., *Polygonella americana* (Fisch. & Mey.) Small [I], *Rumex hastatulus* Ell.

RANUNCULACEAE - *Anemone caroliniana* Walt. [K], *Clematis reticulata* Walt., *Delphinium carolinianum* Walt. [K,R].

Table 1. (continued).

RHAMNACEAE - *Ceanothus americanus* L. [I].
ROSACEAE - *Crataegus uniflora* Muenchh. [K], *Potentilla recta* L. [I], *Prunus angustifolia* Marsh. [I], *Prunus caroliniana* (P. Mill) Ait. [I], *Prunus gracilis* Engelm. & A. Gray, *Prunus umbellata* Ell. [K,R].
RUBIACEAE - *Diodia teres* Walt.
RUTACEAE - *Zanthoxylum clava-herculis* L. [I,K].
SAPOTACEAE - *Bumelia lanuginosa* (Michx.) Pers.
SCROPHULARIACEAE - *Linaria canadensis* (L.) Dum.-Cours., *Penstemon australis* subsp. *laxiflorus* (Pennell) Bennett [K], *P. murrayanus* Hook. [I].
SELAGINELLACEAE - *Selaginella arenicola* Underw. subsp. *riddellii* (Van Eselt.) Tryon [R].
SOLANACEAE - *Physalis heterophylla* Nees., *P. mollis* Nutt. [I,R].
ULMACEAE - *Ulmus alata* Michx.
URTICACEAE - *Parietaria pensylvanica* Muhl. *ex* Willd. [I].
VALERIANACEAE - *Valerianella radiata* (L.) Dufr. [K,R].
VERBENACEAE - *Glandularia canadensis* (L.) Nutt., *Verbena halei* Small [I,R].
VIOLACEAE - *Viola rafinesquii* Greene, *V. villosa* Walt. [I,K].
VITACEAE - *Ampelopsis arborea* (L.) Koehne, *Vitis aestivalis* Michx., *V. rotundifolia* Michx.

Table 2. Soil characteristics of three xeric sandhills in Caddo Parish.

		Exchangeable Ions (ppm)				
Sample	pH	P	K	Ca	Mg	Organic Matter %
Roger Station	5.7	25	50	170	25	1.7
Kendrick	5.6	12	36	270	37	2.3
Ida	5.9	14	34	260	26	1.9

DISCUSSION

Floristically, these three xeric sandhills are essentially the same as xeric sandhills farther south in Natchitoches Parish (MacRoberts & MacRoberts 1994). Since the sample sizes are different, Sorensen's Index of Similarity has not been calculated, but 82% of the species found in one Natchitoches Parish site also occur in the Caddo sandhills.

As mentioned above, in addition to surveying these three sites, we made brief surveys of locations where rare sandhill species had been previously found (Louisiana Natural Heritage files) or which showed up as being on similar soil types to the three study areas (Betis-Briley-Darden, Sacul-Ruston) (Edwards *et al.* 1980).

We found only one other site in the dozens surveyed to be comparable in quality to the three study sites. This site is an oil field with trash piles, pipe lines, well roads, and is badly fire suppressed. We first visited this site in the late 1970's and it has deteriorated substantially. It is briefly described by Teague & Wendt (1994), who consider it to be the highest quality site in the area, a conclusion with which we do not demur, except to emphasize that it is badly degraded.

Most of the other Caddo sandhills are either totally altered from original conditions (*e.g.*, are now pastures, fields, mobile home sites, cemeteries, and churches) or are so badly degraded (*e.g.*, are pine plantation with only a few sandhill species hugging the road edges) as to be basically unrecognizable as once having been xeric sandhills.

These surveys allowed us to compare sandhill communities in central Louisiana and in east Texas (MacRoberts & MacRoberts 1994). Our finding is that none of the Caddo Parish sites is of comparable quality to the best sites in the Kisatchie National Forest or in east Texas (see references in MacRoberts & MacRoberts 1994).

We are chary of estimating total area of this community remaining in Caddo Parish since we did not set out to determine this, but assuming that much of the sandy soils were once xeric sandhills, there is very little left. Today, this community is scattered in small, badly degraded, patches. None is high-quality. While there may be a lot of Betis/Briley/Darden and Sacul/Ruston soils in Caddo Parish, soil occurrence does not translate into a functional plant community. Consequently, we agree with Teague & Wendt (1994) and with the Louisiana Natural Heritage Program in designating this community imperiled in Louisiana.

How much of this community existed in Caddo Parish in presettlement times can only be conjectured, but it probably measured in the thousands of acres. The very little that is left is mostly due to the inadvertent creation of artificial refugia on road sides, and in oil fields and derelict hay fields.

Since xeric sandhills are usually found in badly disturbed areas, it has been assumed that they are "disturbance" communities. This conclusion is a natural one considering the appalling conditions in which sandhill species "hang on," and is probably true to the extent that sandhills surely require repeated but occasional fire for full development. Nevertheless, ground disturbance associated with logging, road construction, and oil field work will eventually destroy these communities. Sandhill species are often found in highly disturbed sandy areas because they require an open habitat and can tolerate some anthropogenic disturbance at least for awhile, but the original structure of both the community and the soil is obliterated under these conditions.

While seldom evident except under fairly intact conditions, sandhill soils are cryptogamous. In open areas among the scattered plants there is a substantial cover of mature cryptogamic crusts. Ground disturbances destroy this layer, leading in turn to rapid erosion, loss of soil nutrients, and rapid water evaporation (Hogan 1994). Also, under intact conditions the surface may have extensive patches of *Cladonia* moss. Neither cryptogamic crusts nor *Cladonia* are frequently encountered in Caddo Parish sandhills.

We believe that xeric sandhills in Caddo Parish have been degraded so badly that little remains of this community. Restoration efforts might simulate or counterfeit what this community might have been in presettlement times, but whether or not such efforts could actually bring the community back is not known.

In the course of this work we kept records of rare sandhill species (Louisiana Natural Heritage Program 1995) that occur in Caddo Parish. These are: *Astragalus soxmaniorum* Lundell, *Coreopsis intermedia* Sherff, *Crataegus uniflora* Muenchh., *Croton argyranthemus* Michx., *Dalea phleoides* (Torrey & A. Gray) Shinners, *Dalea villosa* (Nutt.) Sprengel var. *grisea* (Torrey & A. Gray) Barneby, *Eriogonum longifolium* Nutt., *E. multiflorum* Benth., *Matelea cynanchoides* (Engelm.) Woods., *Mirabilis albida* (Walt.) Heimerl., *Paronychia drummondii* Torrey & A. Gray, *Pediomelum digitatum* (Nutt. *ex* Torrey & A. Gray) Isely, *Pediomelum hypogaeum* (Nutt. *ex* Torrey & A. Gray) Rydb., *Penstemon murrayanus* Hook., *Phacelia strictiflora* (Engelm. & A. Gray) A. Gray, *Polygonella americana* (Fisch. & Meyer) Small, *Prunus gracilis* Engelm. & A. Gray, *Quercus arkansana* Sarg., *Scutellaria cardiophylla* Engelm. & A. Gray, *Selaginella arenicola* Underw. subsp. *riddellii* (Van Eselt.) Tryon, *Streptanthus hyacinthoides* Hook., *Talinum parviflorum* Nutt. *ex* Torrey & A. Gray, *Tetragonotheca ludoviciana* (Torrey & A. Gray) A. Gray, *Thelesperma filifolium* (Hook.) A. Gray, *Tradescantia reverchonii* Bush, *Zornea bracteata* (Walt.) Gmel. Only a few of these did not occur in one or more of the three study sites.

POSTSCRIPT

On our last round of visits to the study sites on November 16, 1995, Kendrick Road was destroyed and a house was being constructed on the site.

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Robert Kral kindly vetted a number of the plants. We thank Julia Larke of the Louisiana Natural Heritage Program for sharing their rare plant data with us and for providing information regarding sites in Caddo Parish. Marilyn Yohe, ARKLA Inc., generously provided us with a copy of the Teague & Wendt (1994) report. D.T. MacRoberts and Tom Wendt reviewed an earlier version of this paper.

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A NEW SPECIES OF *PECTIS* (ASTERACEAE, TAGETEAE) FROM SONORA, MEXICO

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ABSTRACT

A new species, ***Pectis vandevenderi*** B.L. Turner, is described and illustrated from Mpio. de Yecora, Sonora, México. It is clearly related to *P. barberi* but differs in having mostly broader less pustulate leaves, shorter peduncles, and heteromorphic achenes.

KEY WORDS: Asteraceae, Tageteae, *Pectis*, México, Sonora, systematics

Routine identification of Mexican Asteraceae has revealed the following novelty.

PECTIS VANDEVENDERI B.L. Turner, *spec. nov.* Figure 1. TYPE: MEXICO. Sonora: Mpio. de Yecora, Los Pilares, Arroyo Los Pilares (28° 23′ N, 108° 47′ 30″ W), ca. 23 km E of Yecora, 1260 m, "common annual on base bedrock surface", 8 Sep 1995, *T.R. Van Devender 95-919* (HOLOTYPE: TEX!).

Similis *P. barberi* Greenm. sed pedunculis 2-4 cm longis (vice 5-12 cm longis), achenibus discorum et radiorum similaribus (vice heteromorphorum).

Annual herbs 5-6 cm high. Stems glabrous, arising from delicate taproots. Leaves mostly basal, glabrous, the scapes 2-4 times as long as the basal clusters; petioles 1-6 mm long, ciliate with 3-5 pairs of basal cilia 2-3 mm long; blades elliptical to obovate, 1-2 cm long, 0.3-0.5 cm wide, weakly 3-nervate, the margins bearing 3-6 pairs of pustulate glands. Scapes 2-5 cm long, glabrous, bracteate with 1 or more linear-lanceolate scales 1-2 mm long. Heads single to a scape, the apices of the latter somewhat swollen. Involucres turbinate to turbocampanulate, 4-5 mm high; bracts ca. 8, purplish, glabrous, bearing 2-5 pustulate glands, mostly above the middle, the apices scarious, obtuse or rounded. Receptacles hemispheric, 3.0-3.5 mm across, 2.0-2.5 mm high, pock-marked after the achenes detach, or alveolate, the ridges

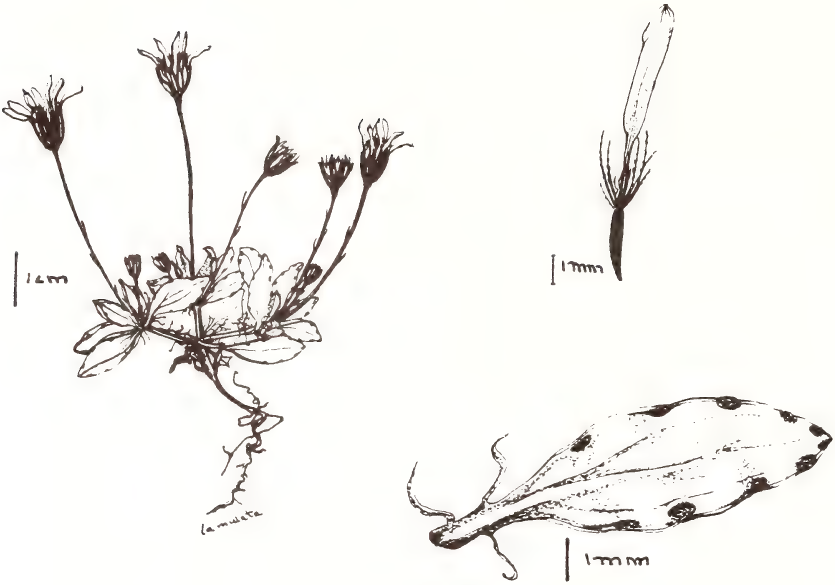

Figure 1. *Pectis vandevenderi*, from holotype; upper right, ray floret; lower right, leaf.

pubescent. Ray florets 8, yellow, pistillate; tubes 2-5 mm long, scabridulous; ligules ca. 5 mm long, 2 mm wide. Disk florets 20-30; corollas ca. 4 mm long, yellow, the lobes ca. 1 mm long. Ray and disk achenes similar, puberulent, 2.5-3.0 mm long, both surmounted by a pappus of 20-30 uneven scabridulous bristles 1-4 mm long.

Pectis vandevenderi is closely related to *P. barberi* but differs from it in having mostly broader, more elliptical leaves with fewer marginal pustules (3-6 pairs vs. 8-15 pairs), shorter peduncles (2-4 cm long vs. 5-12 cm long), the disk and ray achenes having a similar pappus with numerous bristles (vs. ray and disk achenes differing as to pappus).

The species is named for Thomas R. Van Devender, well known expert on packrat middens, and current compiler of the vascular plants of the Río Mayo, Sonora.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Piero Delprete for reviewing the paper.

Phytologia (September 1995) 79(3):136-249.

TAXON INDEX TO PHYTOLOGIA VOLUMES 11-15

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ABSTRACT

A summary of taxonomic citations found in *Phytologia* is made in order to facilitate searching for references to particular plants in the journal. The taxon index for the first volume of *Phytologia* included entries at the species level and above. However, indices for volumes 2 through 67 included entries only at the genus level and above. The present summary of taxon citations includes all citations from volumes 11 through 15. Later summaries will include the remaining volumes through volume 67. Boldface entries indicate that the taxon was originally described or a new combination produced in *Phytologia*.

KEY WORDS: Taxonomic index, new taxa, nomenclature

Taxonomic citations from volumes 11 through 15 are listed alphabetically. Boldface entries indicate that the taxon was originally described or a new combination produced in volumes 11 through 15 of *Phytologia*.

Aberia 15:502
    caffra 15:502
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    lahai 12:231
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    brasiliensis 13:381

Phytologia (September 1995) 79(3):250-253.

AUSTRAL HEPATICAE 23. NEW TAXA AND NEW COMBINATIONS IN *TELARANEA* SPRUCE *EX* SCHIFFN. (LEPIDOZIACEAE)

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ABSTRACT

Telaranea sect. ***Cancellatae***, sect. ***Capillares***, sect. ***Latifoliae***, and sect. ***Transversae*** are described as new sections of the genus. ***Telaranea hodgsoniae***, ***T. pennata***, ***T. lindenbergii*** var. ***complanata***, ***T. lindenbergii*** var. ***mellea***, and ***T. praenitens*** var. ***dentifolia*** are described as new species and varieties from New Zealand. ***Telaranea complanata***, ***T. elegans***, ***T. lindenbergii***, ***T. paludicola***, ***T. tasmanica***, ***T. tetrapila***, ***T. tetrapila*** var. ***roseana***, ***T. tetrapila*** var. ***cancellata***, and ***T. tridactylis*** are new combinations.

KEY WORDS: Hepaticae, Lepidoziaceae, New Zealand, *Telaranea*, systematics

The following new taxa and new combinations are the result of a phylogenetic study of the Australasian species of the genus *Telaranea*, which is currently in preparation by the authors, and a treatment of the genus for the first volume of a Manual of New Zealand Hepaticae. The names are here published separately to make them immediately available for use.

Telaranea sect. ***Cancellatae*** J.J. Engel & G.L. Sm. Merr., *sect. nov.* TYPE: *Lepidozia tetrapila* Hook. *f.* & Taylor *in* Taylor, London J. Bot. 5:370. 1846.

Stirpes notabiles foliis symmetricis, cellulis magnis, pulvinatis, manifeste ordinatim dispositis.

The name of the section refers to the prominent, almost geometrical arrangement of the disc cells in regular rows and tiers.

Telaranea sect. ***Capillares*** J.J. Engel & G.L. Sm. Merr., *sect. nov.* TYPE: *Lepidozia grossiseta* Steph., Spec. Hep. 3:584. 1909.

Stirpes foliis lobis ciliiformibus, cellulis loborum elongatis capillarisque, parietibus incrassatis, septis loborum incrassatis atque projectis distinctae.

The sectional name refers to the elongated, capillary cells of the leaf lobes.

Telaranea sect. ***Latifoliae*** J.J. Engel & G.L. Sm. Merr., *sect. nov.* TYPE: *Lepidozia meridiana* E.A. Hodgs., Trans. Roy. Soc. New Zealand 83:611. 1956.

Stirpes foliis plerumque longitudinaliter insertis, cellulis disci atque loborum inordinatim dispositis, disco ad basin (8-)14-16 cellulas lato dignoscendae.

The name of the section refers to the width of the leaf disc as compared to the majority of species of *Telaranea* subg. *Neolepidozia*, in which the disc is regularly eight cells wide at the insertion.

Telaranea sect. ***Transversae*** J.J. Engel & G.L. Sm. Merr., *sect. nov.* TYPE: *Lepidozia lindenbergii* Gottsche *in* G. L. & N., *Syn. Hep.* 213. 1845.

Stirpes foliis praecipue ± transverse insertis (in *T. tetradactyla* typice oblique insertis), disco humili 2-3(4) cellulas alto distinguendae.

The name of the section refers to the transverse insertion of the leaves in the type species.

Telaranea complanata (Herzog) J.J. Engel & G.L. Sm. Merr., *comb. nov.* BASIONYM: *Lepidozia complanata* Herzog, Memoranda Soc. Fauna Fl. Fenn. 27(1950-1951):92. *f. 39.* 1952.

Telaranea elegans (Colenso) J.J. Engel & G.L. Sm. Merr., *comb. nov.* BASIONYM: *Lepidozia elegans* Colenso, Trans. & Proc. New Zealand Inst. 21:65. 1889 (1888).

Telaranea hodgsoniae J.J. Engel & G.L. Sm. Merr., *spec. nov.* HOLOTYPE: NEW ZEALAND. South Island: Canterbury Prov., Peel Forest, ca. 1500 ft., *Child H2084* --c. o (F); Isotype: (CHR).

T. tetrapilae (Taylor) J.J. Engel & G.L. Sm. Merr. aemulans, differt cellulis foliorum minoribus haud pellucidus autem obscuris, lobulis foliorum brevibus non attenuatis.

The leaf cells have a "hazy" granular appearance under the compound microscope, like frosted glass. Mrs. Hodgson's concept of *T. roseana* Steph. (Hodgson 1956)

was apparently this plant, since all of the specimens in the Christchurch Herbarium (CHR) identified by her as that species belong here; the species is named in her honor.

Telaranea lindenbergii (Gottsche) J.J. Engel & G.L. Sm. Merr., *comb. nov.* BASIONYM: *Lepidozia lindenbergii* Gottsche *in* G. L. & N., *Syn. Hep.* 213. 1845.

Telaranea lindenbergii (Gottsche) J.J. Engel & G.L. Sm. Merr. var. ***complanata*** J.J. Engel & G.L. Sm. Merr., *var. nov.* HOLOTYPE: NEW ZEALAND. South Island: Otago Prov., Whare Flat, W of Dunedin, 70 m, *Engel 17641*--c. sporo. (F).

A *T. lindenbergii* (Gottsche) J.J. Engel & G.L. Sm. Merr. var. *lindenbergii* ramis distincte complanatis, foliis ramorum imbricatis incubis atque oblique patentibus recedit.

Telaranea lindenbergii (Gottsche) J.J. Engel & G.L. Sm. Merr. var. ***mellea*** J.J. Engel & G.L. Sm. Merr., *var. nov.* HOLOTYPE: NEW ZEALAND. South Island: Otago Prov., near Herbert, *Allison H5674* (CHR).

A *T. lindenbergii* (Gottsche) J.J. Engel & G.L. Sm. Merr. var. *lindenbergii* differt pigmentis dilute aeneis, caulibus rigidioris, ramis distantibus flagelliformibus, lobulis foliorum supra basin saepe biseriatis.

The plants are a distinctive pale bronze color, an exception to the absence of secondary pigmentation characteristic of the genus.

Telaranea paludicola (E.A. Hodgs.) J.J. Engel & G.L. Sm. Merr., *comb. & stat nov.* BASIONYM: *Lepidozia meridiana* var. *paludicola* E.A. Hodgs., Trans. Roy. Soc. New Zealand 83:611. *pl. 2, f. 21.* 1956.

Telaranea pennata J.J. Engel & G.L. Sm. Merr., *spec. nov.* HOLOTYPE: NEW ZEALAND. South Island: Westland Prov., Route 73, 8 miles W of Turiwhate, *Engel 6754* (F); Isotype: (CHR).

Species insignis, differt ramis pectinatibus, foliis asymmetricis, lobis ventralibus ad apicem spectantibus, longitudine lobum dorsalem superantibus.

Other *Telaranea* species with asymmetrical leaves have the dorsal lobe(s) larger than the ventral, as in species of *Lepidozia*; the leaves of *T. pennata* are a mirror-image of this, with the dorsal lobe smallest, and the ventral lobes larger and brushed toward the branch tips. The branches are flattened and comb-like.

Telaranea praenitens (Hook. *f.* & Taylor) E.A. Hodgs. var. ***dentifolia*** J.J. Engel & G.L. Sm. Merr., *var. nov.* HOLOTYPE: NEW ZEALAND. South Island: Fiordland, Dusky Sound, Supper Cove, 11 Feb. 1946, *Allan* (CHR).

Varietas foliis ad marginem dentatis lobulis latioribus differt.

Telaranea tasmanica (Steph.) J.J. Engel & G.L. Sm. Merr., *comb. nov.* BASIONYM: *Lepidozia tasmanica* Steph., Spec. Hep. 3:580. 1900.

Telaranea tetrapila (Taylor) J.J. Engel & G.L. Sm. Merr., *comb. nov.* BASIONYM: *Lepidozia tetrapila* Hook. *f.* & Taylor *in* Taylor, London J. Bot. 5:370. 1846.

Telaranea tetrapila (Taylor) J.J. Engel & G.L. Sm. Merr. var. ***roseana*** (Steph.) J.J. Engel & G.L. Sm. Merr., *comb. & stat nov.* BASIONYM: ***Lepidozia roseana*** Steph., Spec. Hep. 3:590. 1909.

Telaranea tetrapila (Taylor) J.J. Engel & G.L. Sm. Merr. var. ***cancellata*** (Colenso) J.J. Engel & G.L. Sm. Merr., *comb. & stat. nov.* BASIONYM: *Lepidozia cancellata* Colenso, Trans. & Proc. New Zealand Inst. 18:244. 1886.

Telaranea tridactylis (Lehm. & Lindenb.) J.J. Engel & G.L. Sm. Merr., *comb. nov.* BASIONYM: *Jungermannia tridactylis* Lehm. & Lindenb. *in* Lehmann, Nov. Min. Cogn. Stirp. Pug. 4:41. 1832.

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Phytologia (September 1995) 79(3):254-256.

NEW COMBINATIONS AND NEW TAXA IN THE BROMELIACEAE

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ABSTRACT

New combinations are proposed in the genera *Werauhia* J.R. Grant and *Tillandsia* Linnaeus as follows, ***Werauhia broadwayi*** (L.B. Smith) J.R. Grant, ***W. dodsonii*** (L.B. Smith) J.R. Grant, ***W. gibba*** (L.B. Smith) J.R. Grant, ***W. guadelupensis*** (Baker) J.R. Grant, ***W. haplostachya*** (Sauvalle) J.R. Grant, ***W. nutans*** (L.B. Smith) J.R. Grant, ***W. rugosa*** (Mez & Wercklé) J.R. Grant, ***W. urbaniana*** (Mez) J.R. Grant, and ***Tillandsia cathcartii*** (Luther) J.R. Grant. The name × ***Vriecantarea*** J.R. Grant is proposed to account for hybrids between the genera *Vriesea* Lindley and *Alcantarea* (E. Morren *ex* Mez) Harms.

KEY WORDS: Bromeliaceae, *Werauhia, Tillandsia,* × *Vriecantarea, Vriesea, Alcantarea,* nomenclature

Continuing an effort to organize species of the bromeliad subfamily Tillandsioideae into natural genera, a number of new combinations are proposed. Examination of newly collected material at InBIO (Instituto Nacional de Biodiversidad [INB], Costa Rica) has provided a convincing argument for the integrity of several species I had previously placed in synonymy (*Vriesea dodsonii* L.B. Smith, *V. nutans* L.B. Smith, and *V. rugosa* Mez & Wercklé). Also, the previously hypothesized generic position of several species in *Werauhia* listed as "doubtful species" in Grant (1995) was verified by the examination of additional specimens. These taxa include *Vriesea antillana* L.B. Smith & Pittendrigh [*Guzmania urbaniana* Mez], *V. broadwayi* L.B. Smith, *V. gibba* L.B. Smith, *V. guadelupensis* (Baker) Mez, and *V. haplostachya* (Sauvalle) L.B. Smith. Of the other dubious taxa listed, *Tillandsia alta* Baker was based on an illustration that appears to be an *Alcantarea* species, *Tillandsia dissitiflora* Sauvalle is recognized as *Vriesea dissitiflora* (Sauvalle) Mez, and the true identity of *Tillandsia camptoclada* Mez & Wercklé is still to be definitively determined.

Werauhia broadwayi (L.B. Smith) J.R. Grant, *comb. nov.* BASIONYM: *Vriesea broadwayi* L.B. Smith, Proc. Amer. Acad. Arts 68:149. 1933. TYPE: TRINIDAD. Heights of Aripo, *Broadway 9916* (HOLOTYPE: TRIN [photo US]; Isotypes: K, NY).

Werauhia dodsonii (L.B. Smith) J.R. Grant, *comb. nov.* BASIONYM: *Vriesea dodsonii* L.B. Smith, Phytologia 8(5):221. 1962. TYPE: COSTA RICA. Without locality. *Wilson & Wilson 31* (HOLOTYPE: US).

Werauhia gibba (L.B. Smith) J.R. Grant, *comb. nov.* BASIONYM: *Vriesea gibba* L.B. Smith, Contr. U.S. Natl. Herb. 29:524. 1954. TYPE: JAMAICA. Knox College, Spaldings, *Dignum 2785* (HOLOTYPE: IJ).

Werauhia guadelupensis (Baker) J.R. Grant, *comb. nov.* BASIONYM: *Tillandsia guadelupensis* Baker, *Handb. Bromel.* 213. 1889. *Vriesea guadelupensis* (Baker) Mez *in* C.DC., *Monogr. Phan.* 9:596. 1896. *Neovriesea guadelupensis* (Baker) Stehlé, Fl. Guad. 1:212. 1936. TYPE: GUADELOUPE. Without locality, *Duchassaing s.n.* (HOLOTYPE: B).

Werauhia haplostachya (Sauvalle) J.R. Grant, *comb. nov.* BASIONYM: *Tillandsia haplostachya* Sauvalle, Anales Acad. Ci. Méd. Habana 8:73. 1871. *Vriesea haplostachya* (Sauvalle) L.B. Smith, Contr. Gray Herb. 114. 1936. TYPE: CUBA. Monte Verde, Oriente, *Wright s.n.* (locality of holotype unknown; Isotype: GH).

Werauhia nutans (L.B. Smith) J.R. Grant, *comb. nov.* BASIONYM: *Vriesea nutans* L.B. Smith, Phytologia 7(4):175. 1960. TYPE: COSTA RICA. San José: Road from Turrialba to Moravia, *Foster 2727* (HOLOTYPE: US).

Werauhia rugosa (Mez & Wercklé) J.R. Grant, *comb. nov.* BASIONYM: *Vriesea rugosa* Mez & Wercklé *in* Mez, Bull. Herb. Boissier ser. 2, 4(9):866. 1904. TYPE: COSTA RICA. Without locality, *Wercklé 115* (HOLOTYPE: B; photo US).

Werauhia urbaniana (Mez) J.R. Grant, *comb. nov.* BASIONYM: *Guzmania urbaniana* Mez *in* C.DC., Monogr. Phan. 9:920. 1896. *Thecophyllum urbanianum* (Mez) Mez, Bull. Herb. Boissier ser. 2, 3:131. 1903. TYPE: MARTINIQUE. Without locality, *Duss 296* (HOLOTYPE: B). ≡ *Vriesea antillana* L.B. Smith & Pittendrigh, J. Wash. Acad. Sci. 43:403. 1953., *nom. nov.* for *Guzmania urbaniana* Mez, not *Vriesea urbaniana* Harms (1935).

As noted by Luther (1995), *Vriesea cathcartii* lies within the "large-flowered-grey-vriesea complex" that I regard as belonging to *Tillandsia* sensu strictu.

Tillandsia cathcartii (Luther) J.R. Grant, *comb. nov.* BASIONYM: *Vriesea cathcartii* Luther, J. Brom. Soc. 45(2):52. 1995. TYPE: ECUADOR. Zamora-Chinchipe: 1.6 km east of Zumbi on Zumbi-Paquisha road, ca. 850 m, August 1994, *D. Cathcart 81794-1* (HOLOTYPE: SEL; Isotype: QCNE).

When the cultivar *Vriesea* 'inferno' [*Vriesea ensiformis* (Vellozo) Beer × *Vriesea regina* (Vellozo) Beer] was proposed (Baskerville 1994), both parent species were referred to the genus *Vriesea* Lindley. Since then, the genus *Alcantarea* (E. Morren *ex* Mez) Harms has been resurrected and includes *Vriesea regina* Vellozo [*Alcantarea regina* (Vellozo) Harms] (Grant 1995). Therefore, in order to account for hybrids between *Vriesea* and *Alcantarea*, a new hybrid generic name is proposed.

× ***Vriecantarea*** J.R. Grant, *nothogen. nov.* Based on *Vriesea* Lindley, Bot. Reg. 19: pl. 10. 1843. and *Alcantarea* (Morren *ex* Mez) Harms, Notizbl. Bot. Gard. Berlin 10:802. 1929.

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Luther, H. 1995. A new *Vriesea* from Ecuador. J. Brom. Soc. 45(2):52-54, 56.

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SYSTEMATICS OF THE *SEDUM PARVUM* GROUP (CRASSULACEAE) IN NORTHEASTERN MEXICO AND TEXAS

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ABSTRACT

In a systematic study of the yellow-flowered species of *Sedum* of northeastern México and Texas, those traditionally interpreted as the *S. parvum* Hemsl. group, we elevate or reinstate to species rank three taxa regarded by Clausen as subspecies of *S. parvum:* ***S. catorce** stat. et nom. nov.* (= *S. parvum* subsp. *dendroides* R.T. Clausen), *S. nanifolium* Frod. (*S. parvum* subsp. *nanifolium* [Frod.] R.T. Clausen), and ***S. diminutum** stat. et comb. nov.* (= *S. parvum* subsp. *diminutum* R.T. Clausen). In addition, three new species are proposed: ***S. dulcinomen*** Nesom, ***S. papillicaulum*** Nesom, and ***S. macdonaldii*** Nesom.

KEY WORDS: Crassulaceae, *Sedum*, México, systematics

This study was begun as a consequence of the observation by McDonald (1991) that two separate species of *Sedum* occur on the tops of the high peaks of southeastern Coahuila. Robert Clausen had earlier identified and annotated nearly all of the yellow-flowered species of *Sedum* in the Sierra Madre of Coahuila and Nuevo León as *S. parvum* Hemsl. subsp. *nanifolium* (Frod.) R.T. Clausen, although many of the collections cited in the present study have been made since his death. With further study, it became apparent that only one of these high elevation taxa could be identified as subsp. *nanifolium*. Several other entities related to *S. parvum*, at high and lower elevations in the Sierra Madre and adjacent areas, represent undescribed species. Further, based on a more restricted species concept than Clausen's, we believe that a group of taxa described by him as subspecies of *S. parvum* are better treated at specific rank. Clausen espoused, theoretically and practically, a very broad species concept (1984, p. 9): "The concept of species is best reserved for a level of differentiation that is major, involves many genetic characters, and is especially distinguished by impressive biological discontinuity where two or more species occur together." The

subspecies of this group, however, are allopatric non-intergrading taxa of northeastern México and the morphological distinctions among them are equivalent to those of accepted species in many genera of various other families.

Distinctive features of the *Sedum parvum* group are yellow, erect petals, yellow anthers and ovaries, and relatively small, elongate leaves drying with a flat to slightly concave adaxial surface (see below). Two other Mexican species clearly are members of the same group, *Sedum reptans* R.T. Clausen of San Luis Potosí and Querétaro, and *S. tamaulipense* Nesom of Tamaulipas. These taxa are distinctive in their spreading petals and fully terete leaves, but in their completely prostrate habit they are perhaps closely related to *S. parvum*. *Sedum nuttallianum* Raf., an erect annual common in Texas and the south-central United States, also appears to be very closely related (Nesom 1988). Clausen (1975) included the latter as the most divergent member of subgenus *Sedum* sect. *Lanceolata*, in which he otherwise included only species from north of México, but he noted that it is related to *S. parvum* "on the basis of morphology and geography." Finally, *S. greggii* Hemsl. and *S. grandipetalum* Frod. of the Trans-Mexican Volcanic Range, and perhaps *S. humifusum* Rose and *S. cupressoides* Hemsl., also appear to belong with this assemblage of taxa. According to Praeger (1921), these would be members of sect. "Seda Genuina Koch" (= sect. *Sedum*).

Other yellow-flowered species of *Sedum* in México may constitute more than one natural group apart from the *S. parvum* group. All, however, have flat (fresh) leaves, mostly 6-20 mm wide (much wider than the taxa treated in the present paper) and 15-40 mm long, and the inflorescences tend to be elevated well above the normally developed cauline leaves. Only one of them, *S. palmeri*, occurs in northeastern México.

Variation in leaf shape and arrangement

Clausen (1978) referred to *Sedum greggii* and *S. grandipetalum* as "heterophyllous," in reference to the "leaves of the elongate floriferous stems [which] are markedly different from those of the vegetative shoots or compact rosettes." Species treated in the present study also present a type of heterophylly, although it may not be homologous with that of those noted above. These produce short, vegetative, lateral branches with spreading, imbricately arranged leaves so densely packed that the stem surface is not evident. Sometimes, however, the floriferous branches of these also produce densely packed leaves resembling those of the lateral branches. In any case, five essentially prostrate species covered in this study (in the key below) do not produce this type of leaf arrangement vegetatively or otherwise but rather the leaves are evenly and well-spaced, leaving the stem surface in view. Such species without a marked dimorphism in leaf morphology Clausen called "homophyllous."

In Clausen's key to the species of the Mexican Cordilleran Plateau (1984), an early couplet distinguished "leaves flat, 2 or more times broader than thick" (*Sedum greggii*) from "leaves terete, subterete, or at least not 2 or 3 times broader than thick" (*S. parvum* and *S. reptans*). These choices were in reference to living material, which Clausen expected users of his key to have on hand (or else field notes describing the original morphology), but the leaves of *Sedum* shrink radically upon drying and it

becomes difficult to surmise the original shape. The relative position of the midvein in dried leaves does provide a clue to the original shape. The key below presents choices based on dried material, and notes on the morphology of fresh material are provided in the species descriptions where this information is available. The leaves of the *S. parvum* group have a strong tendency to markedly flatten when dried, even to the point of displaying two, sharply acute, lateral margins. The leaves of *S. nanifolium* Frod. and *S. macdonaldii* Nesom usually dry with a relatively flat adaxial surface and convex abaxial one with rounded, poorly defined margins. These are referred to as "half-terete" in the descriptions below. Although the leaf shape (in cross-section) is constant within a species, it does not appear to be of critical importance in indicating phylogenetic relationships, if our supposition is correct that *S. nanifolium* is most closely related to *S. chrysicaulum* J.A. McDonald, which has markedly flattened leaves with strongly differentiated margins.

Variation in stem and leaf surface texture

Three basic types of stem morphology in the *Sedum parvum* group can be identified: 1) smooth, non-shiny, without visible cellular structure; 2) smooth, shiny, with elongated cells evident; and 3) papillate, non-shiny, with quadrate cells evident. The following groups of species correspond to the three stem types: 1) *S. reptans*, *S. nuttallianum*, *S. tamaulipense;* 2) *S. parvum*, *S. diminutum* (R.T. Clausen) Nesom, *S. nanifolium*, *S. chrysicaulum*; and 3) *S. papillicaulum* Nesom, *S. macdonaldii*, *S. catorce* Nesom, *S. dulcinomen* Nesom. These three morphologies are so distinctly different that we believe that the three species groups may represent separate phyletic lineages, each including species both of erect and prostrate habit. It is surprising that Clausen did not recognize the usefulness of this character among the species treated in the present study, because he used the same character in several key couplets (Clausen 1984) to delimit groups of species unrelated to the *S. parvum* group.

Description of the *Sedum parvum* group

Unless otherwise noted, the descriptions and measurements below are taken from dried, pressed specimens. Elaboration is found in the paragraphs above.

Erect or prostrate-decumbent perennials, annual in one species, somewhat woody in the lower portions, completely herbaceous in one species. Stems glabrous, smooth or papillate. Homophyllous or heterophyllous, the leaves glabrous, small, 3-10 mm long, drying flat to half-terete. Flowers in congested, terminal cincinni, more diffusely arranged in one species. Petals yellow, sometimes with short, red, longitudinal stripes, separate, each usually with a thick, raised, medial keel widened at the apex, erect to spreading or reflexed. Stamens 10, those opposite the petals adnate to the petal base; anthers yellow, red in one species. Carpels yellow, erect, the follicles erect to spreading, free or sometimes basally connate, baso-ventrally gibbous, each with numerous seeds. Seeds brown, minutely papillate, echinate in one species. Chromosome numbers, n=10 and 26 (known from only 2 species, see below).

KEY TO THE SPECIES OF THE *SEDUM PARVUM* GROUP IN NORTHEASTERN MEXICO AND TEXAS

1. Stems minutely papillate to papillate-glandular, without a sheen....................(2)
   2. Plants prostrate-decumbent from horizontal rhizomes...........9. *S. dulcinomen*
   2. Plants erect, without stolons or creeping rhizomes..............................(3)
      3. Stems 10-25 cm high or long, somewhat glaucous; leaves with prominent, wide, white margins of different texture than the blade; petals often spreading or reflexing...8. *S. catorce*
      3. Plants mostly 4-14 cm high, not glaucous; leaf margins sometimes slightly lighter colored than the blade but then very narrow and not of different texture; petals erect..(4)
         4. Stems densely and minutely papillate, appearing somewhat stipitate-papillate, the cellular structure not clearly perceptible; leaves flattened or slightly convex above and beneath, the cellular structure evident only in the striate, elongated cells at the abaxial base, the margins sharply flattened and translucent-papillate .... 11. *S. papillicaulum*
         4. Stems not distinctly columnar- or stipitate-papillate but with quadrate cells clearly perceptible; leaves half-terete, not strongly papillate but both surfaces with clearly perceptible quadrate cells, the margins rounded and not at all papillate.........................12. *S. macdonaldii*
1. Stems smooth, not at all papillate or glandular-appearing, with or without a sheen. ....(5)
   5. Plants prostrate-decumbent from horizontal rhizomes; leaves and petals without prominent red markings. ....(6)
      6. Stems with a prominent sheen on the lower part, the cells elongate; petals erect, 3-5 mm long..(7)
         7. Rhizomes completely herbaceous; leaves 4-8 mm long, 2-4 mm wide; flowers in compact, terminal cincinni; petals 4-5 mm long; anthers yellow... 1. *S. parvum*
         7. Rhizomes thin but noticeably woody; leaves 3.5-5.3 mm long, 1.3-1.8 mm wide; flowers arranged relatively diffusely along upper branches; petals 3.0-3.5 mm long; anthers red. ....2. *S. diminutum*
      6. Stems without a prominent sheen, the cellular structure not readily apparent, petals spreading, either ca. 2.5 or 6.5-8.5 mm long.............(8)
         8. Petals ca. 2.5 mm long; leaves 2.5-7.0 mm long, 0.8-1.0 mm wide.... ....4. *S. tamaulipense*
         8. Petals 6-8 mm long; leaves 6.5-8.5 mm long, 2.5-3.5 mm wide. ....3. *S. reptans*
   5. Plants erect, without rhizomes; leaves and petals with or without prominent red markings..(9)
      9. Annual; stems without a sheen; leaves and petals without red markings..... ....5. *S. nuttallianum*
      9. Perennial; stems with a prominent sheen at least on the lower part; leaves and petals with prominent red markings. .... (10)
         10. Lower part of stems reddish-shiny; leaves 2.5-3.5 mm long, even in length; petals 4.0-5.1 mm long. ....6. *S. nanifolium*
         10. Lower part of stems golden-shiny; leaves of lower stems 5-6 mm long, 7-10 mm long near the inflorescence; petals 5.0-7.5 mm long ....7. *S. chrysicaulum*

1. *SEDUM PARVUM* Hemsl.

Sedum parvum Hemsl., *Diagn. Pl. Nov. Mex.* 50. 1880. *Altamiranoa parva* (Hemsl.) Rose *ex* Britt. & Rose, Bull. New York Bot. Gard. 3:32. 1903. *Villadia parva* (Hemsl.) Jacobsen, Natl. Cactus Succ. J. 13:76. 1958. TYPE: MEXICO. San Luis Potosí: In regione San Luis Potosí, 6000-8000 ft, 1878, *Parry & Palmer 234* (HOLOTYPE: K; Isotype: GH!).

Sedum pososepalum Frod., Acta Horti Gotob. 10, App.: 66. 1936. TYPE: MEXICO. San Luis Potosí: Alvarez, 13-23 Jul 1904, *Palmer 251* (HOLOTYPE: US; Isotype: GH!).

Prostrate-decumbent, completely herbaceous perennials from creeping rhizomes, producing fibrous, adventitious roots. Stems green, smooth, with a noticeable reddish sheen below, the cells elongated. Leaves evenly sized and spaced, green, usually drying translucent, very flat, narrowly elliptic-oblong to narrowly oblanceolate-oblong, 4-8 mm long, 2-4 mm wide. Petals erect, yellow, 4-5 mm long. Seeds echinate.

San Luis Potosí; rock outcrops or ledges in pinyon pine, pine-oak, pine-fir woods; 2000-2700 m; June-October.

In its prostrate habit, shiny stems, and "homophyllous" leaves, *Sedum parvum* is most similar to *S. diminutum. Sedum reptans*, which also occurs in San Luis Potosí, can be distinguished by its non-shiny stems, longer petals, and papillate seeds.

2. ***SEDUM DIMINUTUM*** (R.T. Clausen) Nesom, *comb. et stat. nov.* BASIONYM: *Sedum parvum* Hemsl. subsp. *diminutum* R.T. Clausen, Bull. Torrey Bot. Club 106:215. 1979. TYPE: MEXICO. Coahuila: Cañada La Hacienda, Sierra de la Madera, NW of Cuatro Cienegas, crevices of limestone in shade of *Quercus*, slope on E side of Cañada, 1860 m, 22 Jul 1978, *R.T. Clausen 78-7* (HOLOTYPE: BH!; Isotypes: BH-3 sheets!).

Prostrate-decumbent perennials from slightly woody rhizomes, producing adventitious, fibrous roots. Stems green, smooth, with a noticeably golden sheen below, the cells elongated. Leaves evenly sized and spaced, green, very flat, narrowly elliptic-oblong to narrowly oblanceolate-oblong, 3.7-5.5 mm long, 1.3-1.8 mm wide. Flowers arranged rather diffusely along upper branches, not in congested cincinni. Petals erect, yellow, 3.0-3.5 mm long. Anthers red.

Known only from the type collection. See comments following *Sedum parvum.*

3. *SEDUM REPTANS* R.T. Clausen

Sedum reptans R.T. Clausen, Bull. Torrey Bot. Club 105:222. 1978. TYPE: MEXICO. San Luis Potosí: Sierra de San Luis Potosí, northern slope of Cerro El Ajugon, 21° 40′ 45″ N, 100° 03′ 20″ W, 1720 m, 7 Sep 1977, *R.T. Clausen 772,036* (HOLOTYPE: BH!).

Sedum reptans R.T. Clausen var. *carinatifolium* R.T. Clausen, *Variation Spec. Sedum* 15, 1981. TYPE: MEXICO. Querétaro: 1 km W of Lazaro Vega, 8 km NE of Vizarron des Montes, 20° 53′ 25″ N, 99° 39′ 40″ W, in depressions in limestone exposed to SE, 2250 m, 14 Apr 1980, *R.T. Clausen 80-29* (HOLOTYPE: BH!; Isotype: BH!).

Completely herbaceous perennials with prostrate, creeping stems producing fibrous adventitious roots and short, erect or decumbent, leafy stems. Cells of stems quadrate, noticeably papillate in the youngest portions. Leaves terete to subterete to carinate above (fresh), drying [somewhat flattened], 6.5-8.5 mm long, 1.5-2.5 mm wide. Petals spreading, 6-8 mm long. Follicles widely spreading, ventrally gibbous, basally connate for ca. 1/4 their length.

Eastern San Luis Potosí to northeastern Querétaro; limestone rocks; 1700-2250 m; April-September.

In its habit, leaf shape, and morphology of its stems and follicles, *Sedum reptans* is similar to *S. tamaulipense*. Clausen (1981) described subsp. *carinatum* as different from subsp. *reptans* "in the length (8.5 versus 6.7 mm) and length-width ratios (4 versus 2.4 of the leaves" and dorsally carinate leaves. These putative differences (we find overlap in the leaf length) do not appear to us to justify formal nomenclature.

4. *SEDUM TAMAULIPENSE* Nesom

Sedum tamaulipense Nesom, Sida 13:22. 1988. TYPE: MEXICO. Tamaulipas: Mpio. San Carlos, Sierra de San Carlos, ca. 5 mi S of San Carlos, N side of Bufa El Diente, 18 Jun 1987, *G. Nesom 6166* (HOLOTYPE: TEX!; Isotypes: BH!, MEXU!,UAT!,WTU!).

Perennial, prostrate herbs with numerous adventitious roots, forming mats, the stems smooth, without a sheen. Leaves narrowly oblong, terete (fresh), drying flattened, 2.5-7.0 mm long, 0.8-1.0 mm wide. Petals ca. 2.5 mm long, yellow, spreading. Follicles spreading, ventrally gibbous, basally connate for 1/2-3/5 their length.

Known only from the Sierra de San Carlos of central Tamaulipas; top of rocks and large boulders with bryophytes, in oak woods with scattered *Carya* and *Abies*; 1100-1250 m; May-August.

5. *SEDUM NUTTALLIANUM* Raf.

Sedum nuttallianum Raf., Atl. J. 1:146. 1832. TYPE: UNITED STATES. [Oklahoma]: drainage of the Red River, Arkansas, 1819, *Nuttall s.n.* (NY). See Clausen (1975) for notes on typification and synonymy.

Erect annual herbs 5-8 cm tall, from a very slender taproot, the stems smooth, without a sheen. Leaves narrowly elliptic-oblong, mostly 3-5 mm long, terete (fresh), drying more or less terete, all more or less similar in size and distribution. Petals yellow, spreading, 2-4 mm long. Follicles widely spreading, ventrally gibbous. Chromosome number, n=10 pairs.

Texas, Oklahoma, Arkansas, Missouri; open areas in shallow soil, commonly over granite or sandstone, usually in the area of oak or oak-juniper woods; April-July.

Probably most closely related to *Sedum tamaulipense*, sharing with it distinctively small petals and spreading, ventrally gibbous follicles.

6. *SEDUM NANIFOLIUM* Frod.

Sedum nanifolium Frod., Acta Horti Gotob. 10, App. 196. 1936. *Sedum parvum* Hemsl. subsp. *nanifolium* (Frod.) R.T. Clausen, Bull. Torrey Bot. Club 105:223. 1978. TYPE: MEXICO. Coahuila: Chojo Grande, 27 mi SE of Saltillo, 16 Jul 1905, *Palmer 722* (HOLOTYPE: UC; Isotype: GH!).

Erect perennials to 20 cm high, homophyllous or rarely producing densely leafy shoots. Stems smooth, prominently reddish-shiny on the lower portions, cells elongated. Leaves widely obovate to obovate-oblong, half-terete (flat adaxially), green with prominent red dots, sometimes waxy, 2.5-3.5(-4.0) (-5.0 in Texas) mm long, 2.0-2.5 mm wide, even in length on upper and lower portions of the stem, cells quadrate. Petals erect, 4.0-5.1 mm long, yellow with prominent, short, red, longitudinal stripes. Chromosome number, n=26 pairs.

Widespread in eastern Chihuahua, Coahuila, central Nuevo León, and apparently rare in Brewster Co., Texas; limestone gravel, ledges, or crevices, in matorral, chaparral, or pinyon pine woods with juniper, oak, or agave; (1200-)1600-2300 (-2700) m; June-November.

Additional collections examined: MEXICO. Chihuahua: NW end of the Sierra del Diablo, ca. 27° 20′ N, 29 Jul 1941, *Stewart 981* (GH). Coahuila: W of El Chorro and ESE of Saltillo, 22 Jun 1978, *Clausen 78,3* (BH-2 sheets); W of Chorro Grande, 25° 23′ N, 100° 48′ W, 23 Apr 1949, *Clausen 7607* (BH-2 sheets, GH); 17 mi S of Arteaga, 18 Aug 1948, *Kenoyer & Crum 2771* (GH); Del Carmen Mts., 2 Sep 1936, *Marsh 862* (TEX); Sierra de Santa Rosa, NW of Muzquiz, 25 Jul 1938, *Marsh 1476* (GH,TEX); 3 mi N of Puerto Flores, 8 Nov 1957, *Moran 6309* (BH); Sierra de la Encantada, 10 km NW of Rancho Buena Vista, 5 Sep 1941, *Stewart 1428* (GH, TEX); near Lirios, SE of Saltillo, *Strauss s.n.* (BH); Cañon de la Barrica, Sierra de la Madera, 20 Aug 1975, *Wendt 1218* (TEX); Sierra del Carmen, E of Pico de Cerda, 11 Aug 1974, *Wendt* 563A (LL); Sierra del Carmen, 7.9 mi N of Rancho El Jardín on road to Mina El Popo, 22 Sep 1973, *Wendt et al.* 63 (LL). Nuevo León: Cañada Zacatosa, 6 km N of La Escondida, 24° 09′ N, 99° 55′ W, 30 Aug 1977, *Clausen 77,32* (BH-2 sheets); Hwy 51 between Dr. Arroyo and Galeana, 34 km S of jct with Hwy 58 at Puerto de Pastores, 28 Jun 1978, *Cochrane et al. 8459* (BH); 2 mi S of Pablillo, 20 Jul 1958, *Correll & Johnston 19889* (LL); Hwy 68, 17.7 mi S of jct of Hwy 60 and 1.6 mi N of Puerto de Cieneguillos, 24 Sep 1973, *Reveal 3409* (BH); Hacienda Pablillo, Galeana, 8 Aug 1936, *Taylor 103* (TEX)

UNITED STATES. Texas: Brewster Co.: on limestone hills in valley at the S end of Del Nortes, *Hinckley 4114* (BH); Doubtful Canyon, Del Norte Mts., Gage Estate, 25 mi S of Alpine, 18 Sep 1947, *Warnock & Hinckley* 7521 (SRSC); Cox

Ranch, 15 mi SE of Alpine, 21 Aug 1960, *Warnock 18644* (SRSC); Doubtful Canyon, Del Norte Mts., 25 Sep 1967, *Warnock 21320* (SRSC).

7. *SEDUM CHRYSICAULUM* J.A. McDonald

Sedum chrysicaulum J.A. McDonald, Sida 14:315. 1991. TYPE: MEXICO. Nuevo León: Mpio. Rayones, summit of Sierra La Marta, ca. 3600 m, 24 Aug 1980, *J. A. McDonald & M. Mayfield 2556* (HOLOTYPE: TEX!).

Erect perennials 5-9 cm high. Stems smooth, prominently golden-shiny on the lower portions, cells elongated. Leaves narrowly oblanceolate-oblong, flat, green with prominent red dots, 2.0-2.5 mm wide, 5-6 mm long on lower stem, 7-10 mm long on the upper portions. Petals erect, 5.0-7.5 mm long, yellow with prominent, short longitudinal, red stripes.

Southeastern Coahuila (Sierra La Viga) and central Nuevo León (Sierra La Marta, Cerro Potosí, Sierra Peña Nevada); grassy subalpine to alpine meadows, often with *Pinus hartwegii* and *P. culminicola*; 3400-3800 m; August-October (November).

Additional collections examined: MEXICO. Coahuila: Mpio. Arteaga, summit of Sierra La Viga, ca. 3600 m, 24 Oct 1984, *McDonald & Gomez 1157* (TEX); Sierra La Viga, 3700 m, 22 Aug 1986, *McDonald 2099* (TEX); Sierra La Marta, 22 Aug 1986, *McDonald 2136* (TEX). Nuevo León: Mpio. Aramberri, Cerro Viejo, 3400 m, 20 Nov 1993, *Hinton et al. 23971* (TEX); Mpio. Doctor Arroyo, Sierra de Peña Nevada, N of Picacho de San Onofre, ca. 3400 m, 30 Nov 1984, *McDonald & Gomez 1298* (TEX); Mpio. Galeana, summit or near summit of Sierra La Marta, 3600 m, 31 Aug 1980, *Hinton et al. 17977* (TEX), Sierra La Marta, 3680 m, 4 Aug 1980, *Hinton et al. 17919* (TEX); 25 Oct 1984, *McDonald & Gomez 1242* (TEX); 22 Aug 1986, *McDonald 2136* (TEX); summit or near summit of Cerro Potosí, 23 Aug 1984, *Lavin 4787* (TEX); Cerro El Potosí, 3810 m, 14 Oct 1970, *Hinton et al. 17303* (TEX).

This is the most widespread of the high-elevation *Sedum* species of northeastern México. It is most closely related to *S. nanifolium*, with which it shares an erect habit, shiny stems with elongated cells, and the distinctive red markings in the leaves and petals.

8. ***SEDUM CATORCE*** Nesom, *nom. et stat. nov.*

Sedum parvum Hemsl. subsp. *dendroides* R.T. Clausen, Bull. Torrey Bot. Club 105:223. 1978. TYPE: MEXICO. San Luis Potosí: 0.5 km W of Real de Catorce, 23° 41′ 24″ N, 100° 53′ 32″ W, cliff of quartzite exposed to southwest, N side of canyon, 2620 m, 23 Aug 1977, *R.T. Clausen 772.028*--pressed from greenhouse-grown plants (HOLOTYPE: BH!; Isotype: BH!). Non *Sedum dendroideum* DC.

Erect to semi-erect, slightly glaucous perennials 10-25 cm high, roots said to be tuberous. Stems strongly woody, sometimes somewhat pendant from cliff sides, reddish, minutely papillate, not at all shiny, cells quadrate. Leaves homophyllous, lanceolate-oblong, flat but from a swollen base, (3.0-)3.5-5.0 mm long, 1.3-2.0 mm

wide, dark green with prominent white margins, venation usually clearly discernible. Petals erect to spreading or reflexed, 6-7 mm long, yellow.

Known only from cited collections.

9. ***SEDUM DULCINOMEN*** Nesom, *spec. nov.* TYPE: MEXICO. Nuevo León: [Mpio. Zaragoza], 2 mi E of Dulces Nombres, succulent on limestone outcrops, 1850 m, 28 Jun 1948, *F.G. Meyer & D.J. Rogers 2699* (HOLOTYPE: BH!).

Sedo catorce Nesom, *S. papillicaulo* Nesom, et *S. macdonaldii* Nesom caulibus papillatis similis sed distinctus habitu prostrati-decumbenti caulibus ex rhizomatibus horizontalibus radicibus adventitiis orientibus; *Sedo catorce* similis caulibus ac foliis glaucis.

Prostrate-decumbent perennials from horizontal, slightly woody rhizomes, producing fibrous, adventitious roots, stems and leaves heavily glaucous (less so in cultivation). Stems green, becoming reddish-tinted, but without discrete dots of red pigment, minutely papillate with quadrate cells, arching upward or erect and arising from the rhizomes. Leaves heterophyllous, green, heavily glaucous (less so in cultivation), flat, elliptic-oblong, 1.5-2.0 mm wide, 2.5-4.5 mm long. Petals erect, yellow, 4.5-6.0 mm long.

Nuevo León, on the Tamaulipas border near Dulces Nombres; limestone ledges and outcrops in pine woods; 1750-2000 m; February-June.

Additional collections examined: MEXICO. Nuevo León: Mpio. Zaragoza: ca. 16 km E of mine in District of Dulces Nombres, Feb 1950, *J.L. Edwards s.n.*--pressed from greenhouse cultivar (BH); ca. 3 km SE of Santa Teresa, "39" Jan 1980. *Clausen U2724*--pressed from greenhouse cultivar (BH).

The three collections studied of *Sedum dulcinomen* are very similar among themselves. The specimen collected from nature (the type), is strongly glaucous, but the greenhouse-grown plants show clear traces of a waxy surface. Among the other species treated in this study, only *S. catorce* produces a glaucous covering.

10. ***SEDUM PAPILLICAULUM*** Nesom, *spec. nov.* TYPE: MEXICO. Nuevo León: Mpio. Zaragoza, Sierra de Peña Nevada, Picacho San Onofre, fir and pine forest, 3000 m, 18 Jun 1979, *Hinton et al. 17551* (HOLOTYPE: TEX!).

Sedo catorce Nesom et *S. macdonaldii* Nesom habitu erecto et caulibus papillatis similis sed distinctus paginis non glaucis, foliis planis, et papillis caulinis columnaribus structuram cellulosam perspicuam carentibus.

Erect, fibrous-rooted perennials 6-25 cm high. Stems suffruticose, prominently minutely and densely papillate, the papillae columnar and sometimes appearing stipitate-glandular, the cellular structure not readily apparent. Leaves oblong-elliptic to lanceolate-oblong, flat, 3-4 mm long, even in length on the upper and lower portions

of the stems, 1.5-2.2 mm wide, the cells quadrate in the distal portions, elongate in the swollen basal portion. Petals erect, yellow, rarely with a reddish tinge, 5-7 mm long.

Nuevo León; subalpine and alpine meadows of Sierra Peña Nevada and vicinity, usually with *Pinus hartwegii* or pine-fir, sometimes in oak-agave woodland; (2700-) 3000-3600 m; June-August.

Additional collections examined: MEXICO. Nuevo León: Mpio. Doctor Arroyo: ridge and E side of Peña Nevada, 5 Jul 1985, *McDonald 1642* (TEX); trail from Cañon La Tinaja to La Encantada, 4 Jul 1988, *Patterson 5837* (TEX); N and NW slope of Picacho Onofre, 10-15 Jul 1977, *Wells & Nesom 369* (TEX). Mpio. Zaragoza: Cerro El Viego, 1800 m, 7 Jul 1992, *Hinton et al. 22125* (TEX); Cerro El Viego, 3360 m, 6 Oct 1992, *Hinton et al. 22147* (TEX); 9 km N of La Encantada, 2700 m, 25 May 1992, *Hernández et al. 2284* (TEX); 2 m NE Cerro Peña Nevada, 2690 m, 23 Aug 1989, *Nesom 7121* (TEX). Tamaulipas: 15 km NW Estanque de los Walle, 2000 m, 25 Oct 1989, *Hernández S. 2063* (TEX).

A distinctive species restricted to the Peña Nevada area of southeastern Nuevo León but closely similar to *Sedum macdonaldii*, which appears to be its northern vicariad.

11. ***SEDUM MACDONALDII*** Nesom *spec. nov.* TYPE: MEXICO. Nuevo León: Mpio. Galeana, Sierra La Marta, S and SE sides at the top, alpine and subalpine zone, 22 Aug 1986, *Andrew McDonald 2135* (HOLOTYPE: TEX!); Isotypes: MEXU,BH).

> *Sedo catorce* Nesom et *S. papillicaulo* Nesom habitu erecto et caulibus papillatis similis sed distinctus paginis non glaucis, foliis semi teretibus et cellulisquadratis in lineis papillas caulinas formantibus.

Erect fibrous-rooted perennials 4-7 cm high. Stems mostly obscured by the leaves but the surfaces low-papillate with quadrate cells in lines. Leaves half-terete, flat above with a medial sulcus, both surfaces with quadrate cells from tip to base, minutely striate-papillate, the cellular structure clearly perceptible. Petals yellow, erect, 6-7 mm long.

Coahuila (Sierra Coahuilón, Sierra La Viga), Nuevo León (Cerro Potosí and Sierra La Marta); subalpine and alpine zones, often with *Pinus hartwegii*, *Pinus culminicola*, or *Pseudotsuga*; 2850-3600 m; July-October.

Additional collections examined: MEXICO. Coahuila: Mpio. Arteaga, ridge and SE side of Sierra Coahuilón, 22 Jul 1985, *McDonald 1762* (TEX); summit of Sierra La Viga, 24 Oct 1984, *McDonald & Gomez 1158* (TEX). Nuevo León: Mpio. Galeana: Sierra La Marta, near top, 5 Jul 1981, *Hinton et al. 18310* (TEX); SE side of Cerro Potosí, 25 Jun 1960, *Beaman 3321* (GH); near top of Cerro Potosí, 3500 m, 23 May 1988, *Westlund 23* (TEX).

Sedum macdonaldii apparently is most closely related to *S. papillicaulum*, which differs in its flat (dried) leaves with a basal area of elongated cells and its strongly stipitate-papillate stems, the cellular structure of which is not at all discernible.

INCERTAE SEDIS

Sedum robertsianum E.J. Alexander, Bull. Torrey Bot. Club 63:201. 1936. *Sedum parvum* Hemsl. subsp. *robertsianum* (E.J. Alexander) R.T. Clausen, *Variation Spec. Sedum* 16. 1981. TYPE: UNITED STATES. Texas: Brewster Co., mountain top in shallow calcareous soil, 4000 ft, *A.R. Davis s.n.* (HOLOTYPE: NY, from cultivar of Davis collection.)

Clausen (1981) could not find the type at NY and made the following comment: "Because no type is at the New York Botanical Garden, a part of the type material, made available by Mr. Alexander and cultivated and pressed at Cornell University on July 22, 1937, may serve as the lectotype. The specimen is in the herbarium at Cornell University."

[It] "combines features of the other subspecies: longer leaves (8.6 mm) as in ssp. *diminutum*, wider leaves (3.7 mm) as in ssp. *nanifolium*, longer anthers (1.1 mm) as in ssp. *dendroides*, narrower nectaries (0.4 mm) as in spp. *diminutum*, and later flowering (Aug.-Sept.) as in ssp. *parvum*. It is the most herbaceous of the five subspecies. Otherwise, it is similar to the other subspecies in having cymes of 1-2 cincinni, yellow flowers, gibbous follicles, and fuscous, papillose seeds." Clausen (ms), in his forthcoming treatment of *Sedum* for the Flora of the Chihuahuan Desert (Henrickson, in prep.), places *S. robertsianum* in synonymy under *S. parvum* Hemsl.

Erect, fibrous-rooted perennials. Stems [papillate?], both stems and leaves "red-streaked and spotted." Heterophyllous, the leaves 5-8 mm long, 3-4 mm wide, subterete (fresh), papillate, the cells quadrate. Petals yellow, 4 mm long, spreading-reflexed. Carpels erect, the follicles spreading, baso-ventrally gibbous.

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THE GENUS *TETRANEMA* (SCROPHULARIACEAE) IN COSTA RICA, WITH TWO NEW SPECIES

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ABSTRACT

Two new species of *Tetranema* (Scrophulariaceae) are described from Costa Rica: ***T. gamboanum*** Grayum & Hammel, known from wet forests on both slopes, and ***T. floribundum*** Hammel & Grayum, endemic to Cerro Turrubares in the mid-Pacific region. Both are unusual in having a long-stemmed growth habit and red, tubular corollas presumably adapted for pollination by hummingbirds. The new species are most similar, at least in floral morphology, to the Mexican endemic *Tetranema megaphyllum* (Brandegee) L.O. Williams. These are the first records of the genus from south of Honduras, and increase the total number of species from four to six.

KEY WORDS: Costa Rica, Scrophulariaceae, *Tetranema*, systematics

A wealth of botanical material gathered during the exploration of a remote region on the Atlantic slope of Costa Rica's Cordillera de Talamanca in April, 1989, included one particularly remarkable collection made by Costa Rican botanist Gerardo Herrera. This collection was remarkable in representing a conspicuous, terrestrial herb--an asterid dicot with bright red, tubular corollas ca. 5 cm long--that we were unable to identify even to the generic level. Though its flowers superficially resembled those of some Acanthaceae known from the region [*Odontonema tubaeforme* (Bertol.) Kuntze, *Razisea spicata* Oerst.], the Herrera collection was soon identified as belonging to Scrophulariaceae. However, the combination of a caulescent, subshrubby growth habit and axillary, long-pedunculate, bracteolate, cymose inflorescences seemed incompatible with any known genus; indeed, we entertained the notion of establishing a new genus to accommodate this collection and other, similar material that has subsequently emerged from Costa Rica.

With respect to their shrublike habit, axillary, cymose inflorescences and red, tubular corollas, the abovementioned Costa Rican collections suggest the genus *Russelia* Jacq., of the monotypic tribe Russeliae. *Russelia* differs, however, in having septicidal capsules densely packed with hairs. The Costa Rican material better concords with tribe Cheloneae *sensu* Thieret (1954), characterized by bracteolate,

cymose or racemose inflorescences and sterile posterior stamen filaments. The only members of this group occurring naturally in the Mesoamerican region are the large genus *Penstemon* Schmidel and the oligotypic *Tetranema* Benth. *ex* Lindl. and *Uroskinnera* Lindl. (though none of these have been recorded from south of Honduras). Each of these three genera includes at least one species with red, tubular, presumably hummingbird-pollinated flowers (see, *e.g.*, Daniel & Breedlove 1992).

Tetranema differs from *Penstemon* and *Uroskinnera* in having axillary and cymose (rather than terminal and racemose or thrysoid) inflorescences and much reduced sterile stamens (staminodes); it further differs from *Uroskinnera* in having distinct sepals, and from *Penstemon* in having loculicidal capsules. In all of these critical details, the Costa Rican material accords perfectly with *Tetranema*. Moreover, the seeds of the one Costa Rican collection examined in this regard (Figure 2) are a very convincing match for those of *Tetranema roseum* (M. Martens & Galeotti) Standl. & Steyerm., as illustrated by Beaufort-Murphy (1983: Pl. 4G) (who, unfortunately, did not study *Uroskinnera* or *Penstemon*).

Our initial attempts to identify the Costa Rican *Tetranema* collections to genus level were thwarted by our reliance on Standley & Williams's (1973) *Flora of Guatemala* Scrophulariaceae treatment. In their generic key (p. 321), the leads are inverted in the couplet purporting to separate *Tetranema* from *Uroskinnera* and *Penstemon* (as pointed out by Daniel & Breedlove 1992). Furthermore, the three *Tetranema* species attributed to Guatemala are all quite unlike the Costa Rican material in being acaulescent or short-stemmed herbs with campanulate, white or purple (*fide* Standley & Williams) corollas.

Tetranema has heretofore been considered a genus of four species, ranging from southern México (Puebla) to Honduras (Méndez-Larios & Villaseñor 1995). *Tetranema roseum*, the most wide-ranging species, is of modest horticultural repute as a glasshouse plant, with at least two cultivars available commercially under the name "Mexican foxglove" (Morrison 1981).

The Costa Rican material of *Tetranema* is here treated as comprising two species new to science, bringing the generic total to six. *Tetranema gamboanum* Grayum & Hammel is represented by the Herrera collection from the Atlantic slope and several subsequent collections from wet-forest sites on the Pacific slope, while *T. floribundum* Hammel & Grayum is known only by three collections from Cerro Turrubares, an isolated peak in the central Pacific region.

TETRANEMA GAMBOANUM Grayum & Hammel, *spec. nov.* TYPE: COSTA RICA. Puntarenas: Cantón de Osa, Fila Costeña, cabeceras del Río Piedras Blancas, Cerro Anguciana, 8° 49′ 12″ N, 83° 11′ 15″ W, 900 m, 7 Dec 1993 (fl., fr.), *Aguilar et al. 2700* (HOLOTYPE: INB!; Isotypes: BM!,CAS!,CR!,F!, MEXU!,MO!,NY!,US!). Figures 1-2.

Species cum *Tetranemata megaphyllo* (Brandegee) L.O. Williams optime congruens sed differt foliis apice longiacuminatis bracteis inflorescentia brevioribus corolla longiore lobis corollae multo longioribus.

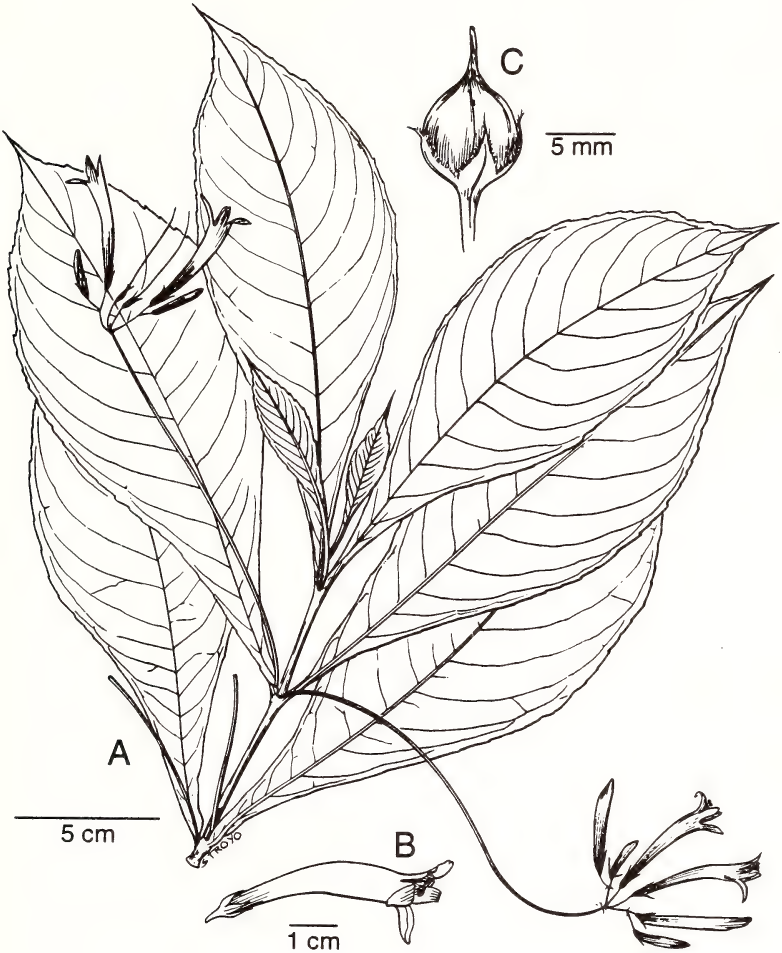

Figure 1. *Tetranema gamboanum*. A. flowering shoot (*Aguilar et al. 2700*); B. flower (*Aguilar et al. 2700*); C. fruit (*Hammel et al. 19429*).

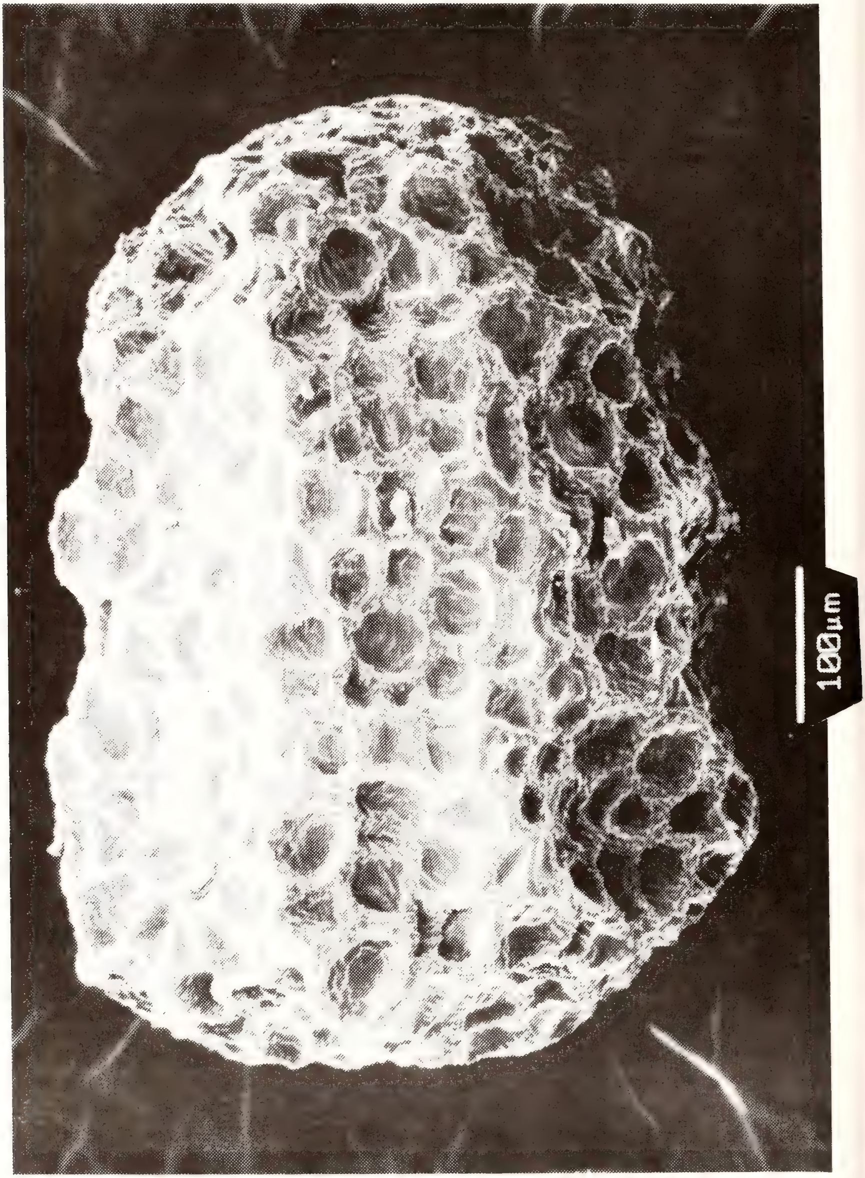

Figure 2. *Tetranema gamboanum* (*Hammel et al. 19542*), seed; × 150 (photo by Betty Strack).

Erect, decumbent-based herbs 1-2+ m tall. Internodes to at least 11 cm long, strigulose when young. Petioles obsolete to ca. 1 cm long, strigulose, canaliculate above, the margins ciliate proximally, the hairs extending in a line across the node. Leaves 14-31 × 5-11 cm, elliptical to oblanceolate or spatulate, long-acuminate at apex, attenuate to the base (where decurrent onto the petiole), the margins ± coarsely serrate, glabrous above or with few, distant hairs along the midrib and major veins (especially proximally), pubescent along the veins below, midrib often falcate, primary lateral veins ca. 9-13 per side, prominulous on both sides when dry. Inflorescences axillary, cymose; peduncle 9-24 cm long, divergent, green, quadrangular with the angles narrowly winged. Flowers ca. 2-12 per inflorescence, bracteate, the bracts 0.5-2.0 mm long, subulate to narrowly triangular, ciliate on margins; pedicels ca. 9-11 mm long at anthesis, to ca. 20 mm in fruit, glabrous; calyx 5-merous, divided nearly to base, the lobes ca. 3-5 mm long at anthesis (to ca. 6 mm in fruit), ± narrowly to broadly ovate, imbricate, ± cornute apically, ciliate on margins; corolla ca. 4.9-5.5 cm long, scarlet, tubular, slightly curved (convexly) upward and gradually expanded distally, glabrous throughout or (*Herrera & Chacón 2644*) with flat hairs at the mouth and onto the lower lobes, the lobes 4, 11-13 × 3.0-3.5 mm, imbricate, lanceolate, the 3 lower ones obtuse to rounded apically and spreading-reflexed, the upper one emarginate and slightly wider; fertile stamens 4, exserted from the throat (but not exceeding the upper corolla lobe); filaments attached at base of corolla tube, glabrous, ± dilated toward base; anther sacs 0.8-1.0 mm long, confluent apically and becoming divergent, glabrous; staminode ca. 1.5-2.0 mm long; ovary 3-4 mm long, narrowly ovoid, glabrous; style exserted, glabrous; stigma clavate to funnelform, hollow, the rim papillose; fruit a loculicidal capsule, ca. 6-9 mm long, subglobose-apiculate; seeds ca. 0.6-0.7 × 0.45 mm, oblong, amber to black, densely foveolate.

Additional specimens examined: COSTA RICA. Limón: Cordillera de Talamanca, entre Cerro Muchilla y Cerro Avioneta, cabeceras de Río Suruy, Fila Matama, 9° 47′ 25″ N, 83° 06′ 30″ W, 550 m, 17 Apr 1989 (fl.), *Herrera & Chacón 2644* (BM,CR,INB,MEXU,MO,USJ). Puntarenas: Cantón de Osa, upper head waters of Río Piedras Blancas, W slopes of Cerro Anguciana, Fila Cruces, 8° 49′ 12″ N, 83° 11′ 09″ W, 950-1,150 m, 10 Dec 1993 (fl.), *Grayum 10663* (CAS,BM,CR, F,INB,MEXU,MO); same locality, 7 Dec 1993 (fl., fr.), *Hammel et al. 19200* (CR, INB,F,MO). San José: Cantón de Pérez Zeledón, Fila Costeña, Fila Tinamastes, por la carretera entre Dominical y San Isidro, 9° 18′ 43″ N, 83° 46′ 19″ W, 950 m, 3 Feb 1994 (fl., fr.), *Hammel et al. 19429* (COL,CR,INB,MICH,MO,TEX); same locality, 28 Mar 1994 (fl., fr.), *Hammel et al. 19542* (CR,INB,MO; live at MO).

Tetranema gamboanum is endemic to Costa Rica, where it is known by a single collection from the Atlantic slope of the Cordillera de Talamanca (Fila de Matama) at 550 m elevation, and from two widely separated sites in the Pacific Fila Costeña at ca. 900-1,000 m (Figure 3). All of these stations appear to lie in the Premontane Rain Forest Life Zone of the Holdridge system (*cf.* Tosi 1969). Flowering material of *T. gamboanum* has been collected from December through April.

As mentioned previously, Costa Rican material of *Tetranema* does not concord with any of the three species treated in the *Flora of Guatemala* (Standley & Williams

1973). It does, however, compare reasonably well with the Chiapan endemic *T. megaphyllum* (Brandegee) L.O. Williams, at least in terms of gross floral morphology. The original description of *Allophyton megaphyllum* Brandegee (1914) specified tubular, red corollas ("Corollae tubus cylindraceus . . . Corollae coccineae") that "resemble those of *Russelia*," and subsequent descriptions agree on this point. This is the only *Tetranema* species from north of Costa Rica that has tubular corollas, though those of *T. evolutum* Donn. Sm. may be red (*fide* Méndez-Larios & Villaseñor 1995; Standley & Williams described them as "bright purple").

Tetranema gamboanum would seem to differ from *T. megaphyllum* in comprising taller (1-2+ m), coarser plants. Although the specimens of the latter species studied by Brandegee (1914) were "not complete enough to give the size of the plant," the leaves were said to be "crowded," suggesting that the plants may have been short-stemmed. Pennell (1925), the first to ally the "most remarkable" *Allophyton megaphyllum* with *Tetranema* (using the name *Allophyton* Brandegee for the entire group), stated that "all the species of *Allophyton* have short stems," more specifically, "1 dm long or less." Pennell cited three duplicates of a topotype collection (*Purpus 7921*) not cited by Brandegee. Méndez-Larios & Villaseñor (1995), citing three additional collections not seen by previous authors, characterize *T. megaphyllum* as "la especie con desarrollo vegetativo más vigoroso"; nevertheless, they describe it as having "tallos muy reducidos," 25-40 cm tall.

Although we have been unable to obtain the holotype of *Tetranema megaphyllum* on loan, we have studied an isotype (*Purpus 6855* [NY]), as well as the NY duplicate of the topotype cited by Pennell (1925). While neither of these specimens bears label data indicating either the habit of the plants or the color of the corollas, the following differences from *T. gamboanum* are manifest: *T. megaphyllum* has inflorescence bracts to ca. 10 mm long and corollas ca. 2.5-3.6 cm long with rounded, apparently forward-directed lobes ca. 2-4 mm long; *T. gamboanum*, on the other hand, has inflorescence bracts to ca. 2 mm long and corollas ca. 5 cm or more long with elongate, spreading-reflexed lobes ca. 11-13 mm long. These observations are corroborated by Méndez-Larios & Villaseñor's (1995) description of *T. megaphyllum*.

The occurrence of *Tetranema gamboanum* on both the Atlantic and Pacific slopes has innumerable precedents in the Costa Rican flora. The lone collection from the Atlantic slope (*Herrera & Chacón 2644*) is essentially a perfect match for the Pacific material, except for the unusual corolla hairs noted in the description. Whether or not these hairs are characteristic of Atlantic populations, and thus potentially indicative of infraspecific rank, cannot be decided without additional material.

Tetranema gamboanum is probably more widespread in Costa Rica than our scattered records indicate; it may also yet be found in Panamá. Although it is locally more or less abundant, none of the three known stations lies within a protected area. This appears to be a species of relatively undisturbed habitats.

We take great pleasure in dedicating this new species to William Gamboa Elizondo (1958-) of Las Mellizas de Coto Brus, Costa Rica, who has participated enthusiastically in virtually every major botanical expedition into the Cordillera de Talamanca since 1983 as cook, porter, scout, negotiator, and occasional collector.

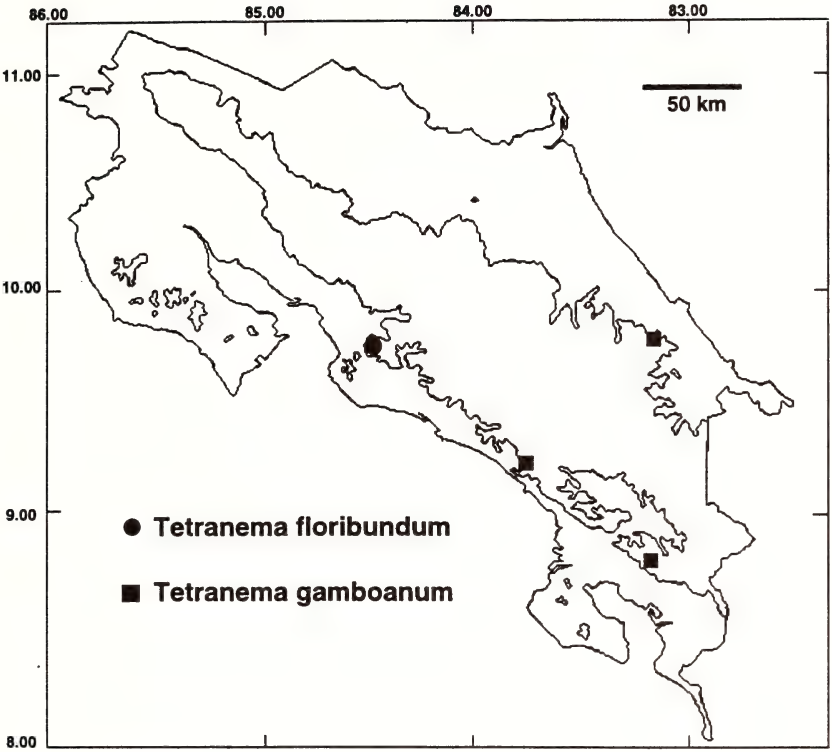

Figure 3. Distribution of *Tetranema* in Costa Rica (500 m contour is indicated).

TETRANEMA FLORIBUNDUM Hammel & Grayum, *spec. nov.* TYPE: COSTA RICA. San José: lado N de Cerro Turrubares, al S de San Rafael por Quebrada Pital, 9° 48′ 05″ N, 84° 27′ 52″ W, 1,200-1,300 m, 5 Jan 1996 (fl., fr.), *Hammel, Jiménez, & Morales 20068* (HOLOTYPE: INB!; Isotypes: BM!,CR!,F!,MO!). Figure 4.

Species ex affinitate *Tetranematis megaphylli* (Brandegee) L.O. Williams et *T. gamboani* Grayum & Hammel, ab utroque inflorescentiis omnibus (8-)14-30-floris tubo corollae intus ventraliter in longitudinem pubescenti distincta.

Erect, decumbent-based herbs (0.35-)0.80-2.00 m tall, often rooting at decumbent nodes. Internodes to at least 5 cm long, densely matted-, arachnoid-, or woolly-pubescent when young. Petioles essentially obsolete, the often undulate margin of the leaf blade reaching nearly to the node. Leaves 21.0-23.5 × 9-13 cm, broadly elliptic to oblanceolate or spatulate, rounded, abruptly acute or short-acuminate at apex, acute to mostly concavely and abruptly attenuate to the base, the margins coarsely serrate to undulate-toothed, glabrous above except on the midrib at the very base, strigulose on the midrib and main veins below and minutely scaly (and thus shiny, when dry) throughout the abaxial leaf surface, midrib occasionally falcate, primary lateral veins 8-10(-11) per side, prominent below. Inflorescences axillary, cymose; peduncle 13-23 cm long, purple, quadrangular with the angles narrowly winged. Flowers ca. (8-)14-30 per inflorescence, bracteate, the bracts 1-5 mm long, narrowly triangular, ciliate (often only at base) on margin; pedicels ca. 10 mm long at anthesis, to ca. 20 mm in fruit, glabrous; calyx 5-merous, divided nearly to base, the lobes 2-3 mm long at anthesis (to 4 mm in fruit), broadly ovate, ± cornute apically, ciliate on margins; corolla 2.6-3.5 cm long, red, tubular, gradually slightly curved (convexly) upward and expanded distally, glabrous externally, internally pubescent with a narrow band of flat, yellow hairs (to ca. 1 mm long) on the ventral surface of the tube from near the base to the mouth and often all along the median lower lobe, the lobes 4, ca. 13 × 2.5-5.5 mm, ± lanceolate, the 3 lower ones rounded apically and spreading-reflexed, the upper one emarginate and slightly wider; fertile stamens 4, exserted from the throat (but held just below the upper corolla lobe and not exceeding it); filaments attached at the base of the corolla tube; anther sacs 0.8-0.9 mm long, confluent apically (where attached to the filament), divergent at dehiscence (full length) and then broadly elliptic, glabrous; staminode ca. 0.5 mm long; ovary ca. 3.5 mm long, narrowly ovoid, glabrous; style exserted (with the stamens), glabrous; stigma clavate, hollow; fruit to ca. 8 mm (immature), ovoid.

Additional specimens examined: COSTA RICA. San José: Cantón de Turrubares, Z. P. Cerros de Turrubares, Potenciana arriba, cerca del Cerro Turrubares, 9° 48′ 00″ N, 84° 27′ 10″ W, 1,600 m, 4 Mar 1993 (fl., fr.), *Jiménez et al. 1155* (BM,CR,INB,MO); Z. P. Cerros de Turrubares, Cerros de Puriscal, sector San Rafael, Sitio Cerro Pelón, 09° 49′ 00″ N, 84° 28′ 50″ W, 1,200 m, 6 Dec 1991 (fl.), *Zúñiga 599* (INB).

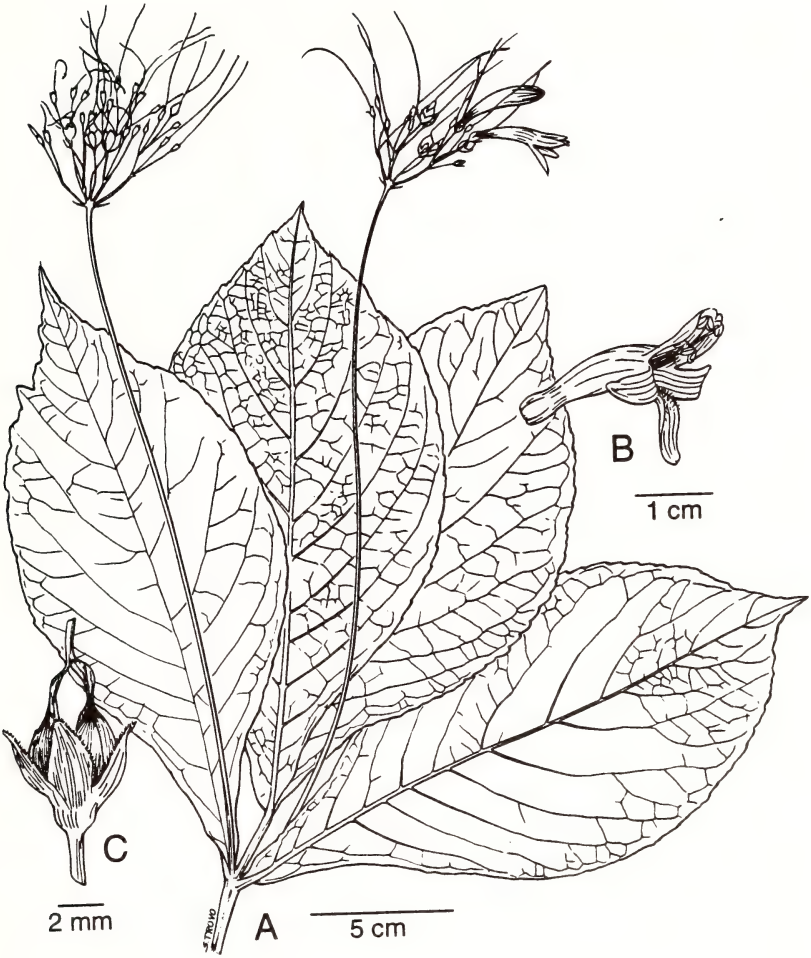

Figure 4. *Tetranema floribundum*. A. flowering shoot (*Jiménez et al. 1155*); B. corolla (*Hammel et al. 20068*); C. fruit (*Jiménez et al. 1155*).

Tetranema floribundum is endemic to Costa Rica, where it is known only from Cerro Turrubares, an isolated peak in the central Pacific region, at 1,200-1,600 m elevation (Figure 3). This region apparently corresponds to the Lower Montane Rain Forest Life Zone of the Holdridge system (*cf.* Tosi 1969). The three flowering collections of *T. floribundum* are from December, January, and March.

The specific epithet of *Tetranema floribundum* reflects the fact that it has more flowers (ca. 14-30) per inflorescence, on average, than any other known *Tetranema* species (*T. roseum* may have as many as 20). It differs additionally from *T. gamboanum* and *T. megaphyllum*, the only other species with red, tubular corollas, in having the corolla tube internally pubescent along the ventral surface. The corollar pubescence of the sole Atlantic slope collection of *T. gamboanum*, discussed previously, does not extend into the tube. *Tetranema floribundum* is further distinguished from *T. gamboanum* in having (as *T. megaphyllum*) merely acute to short-acuminate (rather than long-acuminate) leaf apices and smaller corollas, and from *T. megaphyllum* in having (as *T. gamboanum*) longer stems and generally larger corollas with relatively and absolutely much longer, spreading-reflexed lobes.

It may seem unusual that *Tetranema* populations on Cerro Turrubares, in the central Pacific region of Costa Rica, should differ specifically from populations in the southern Pacific region, while the latter populations should be conspecific with material from the Atlantic slope (as discussed under *T. gamboanum*). Cerro Turrubares, however, is relatively high and quite isolated, and is known to harbor other endemic plant species (*cf.* Burger & Jiménez 1994). *Tetranema floribundum* occurs at slightly higher elevations and, ostensibly, in a different life zone than *T. gamboanum*.

Tetranema floribundum should presently be considered an endangered species, since it is known from just a few populations in a site that has already been seriously degraded by human activity. Two of the three collections were made within a protected area (Zona Protectora Cerro de Turrubares), but from a region dominated by pastures.

Both of the new Costa Rican *Tetranema* species described herein will come out to *T. megaphyllum* in the key of Méndez-Larios & Villaseñor (1995). The distinguishing characteristics of these three species may be summarized as follows:

1. Corolla lobes ca. 2-4 mm long, < 1/5 the total corolla length, apparently directed forward; floral bracts ca. 6-10 mm long; stems ca. 0.25-0.40 m tall; leaf apex acute to short-acuminate; inflorescence 3-10-flowered; corolla ca. 2.5-3.6 cm long, glabrous throughout; Chiapas. .... *T. megaphyllum.*

1′ Corolla lobes ca. 11-13 mm long, > 1/5 the total corolla length, spreading-reflexed; floral bracts 0.5-5.0 mm long; stems (0.35-)0.80-2.00 m tall; Costa Rica. ....(2)

  2. Inflorescence many- (14-30-) flowered, the peduncle purple; corolla 2.6-3.5 cm long, pubescent within in a band of flat, yellow hairs along the entire ventral surface and onto the lower lobe; leaf apex rounded to short-acuminate; Cerro Turrubares. .... *T. floribundum*

2' Inflorescence few- (2-12-) flowered, the peduncle green; corolla ca. 4.9-5.5 cm long, glabrous throughout or (rarely) pubescent on lower lobe and at mouth; leaf apex long-acuminate; Fila Costeña and Atlantic slope of Cordillera de Talamanca. .... *T. gamboanum*

The recent discovery of *Tetranema* in Costa Rica is surprising, especially since both species comprise shrubby, understory plants with large, vividly scarlet corollas. Though the distribution of the genus in Costa Rica appears spotty, *T. gamboanum*, at least, may be locally abundant. At the Tinamastes site, a sizeable population occurs right at the roadside along a moderately well-botanized route (San Isidro de El General to Dominical).

It is likely that earlier Costa Rican collections of *Tetranema*, not seen by us, will yet be discovered filed as undetermined, or misdetermined, in some of the many scattered herbaria housing Costa Rican material. As in the case of *Ticodendron* (Ticodendraceae), another conspicuous Central American plant described only recently, the belated recognition of *Tetranema* in Costa Rica is "perhaps explainable by the fact that although it looks very much like something well known [*e.g.*, an Acanthaceae, *Scutellaria*, or *Russelia*], it really is something different" (Hammel & Burger 1991: 92).

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KEY TO THE AMERICAN GENERA OF ASTERINAE (ASTERACEAE)

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ABSTRACT

An artificial key is provided for identification of *Aster* sensu stricto and the fourteen genera that have been recently proposed to encompass the ca. 180 New World species segregated from *Aster: Almutaster, Ampelaster, Canadanthus, Chloracantha, Doellingeria, Eucephalus, Eurybia, Ionactis, Oclemena, Oreostemma, Psilactis, Sericocarpus, Symphyotrichum*, and *Tonestus*. *Aster* sensu stricto is represented by only a single species native to the New World, *A. alpinus*. Also included in the key are *Aster tataricus*, naturalized in eastern North America, and the distinct genus *Boltonia*, which is often associated with a group of Old World *Aster*.

KEY WORDS: *Aster*, Asteraceae, Asterinae, New World, systematics

In a systematic review of the genus *Aster* as it has been broadly conceived in recent treatments, it was proposed that the ca. 180 American species of this alliance be divided among a number of segregates (Nesom 1994). In this view, only a single species of *Aster* sensu stricto occurs natively outside of the Old World: *A. alpinus* grows in northern Eurasia and across Beringia into Alaska and southward along the Rocky Mountain cordillera as far as Colorado. *Aster tataricus*, which is native to northeast Asia, is naturalized in the eastern United States; as noted in the review, this species probably should be placed in a genus separate from *Aster* sensu stricto. Only *Doellingeria* among the American segregate genera also has species in the Old World.

Several of the genera included here (particularly *Tonestus, Ionactis, Boltonia*, and *Chloracantha*) are ambiguous in their relative positions among other potentially related genera (Nesom 1994). *Tonestus kingii* is the only species of that genus that has been treated within *Aster*, and *Tonestus* may be more closely related to the Solidagininae than to genera it is associated with among segregates of *Aster*. *Ionactis* has been hypothesized to be related to *Eucephalus* and to the goldenasters, but it differs from both in a number of critical morphological features. *Boltonia* is isolated among American genera associated with *Aster*; it has long been considered to be closely related to the Asian genus *Kalimeris* (an *Aster* segregate), but morphological features

in the key below suggest that it may be closer to the South American subtribe Brachycominae. *Chloracantha* also appears to be phyletically isolated although it is similar to *Boltonia* in some features, particularly habit. Other North American species previously treated within *Aster* have recently been repositioned in *Erigeron* and *Machaeranthera*, and several South American species of *Aster* sensu lato have recently been dispersed among phyletically diverse genera.

The recognition of the genera segregated from *Aster* apportions the morphological variation into reasonably discrete entities, but apparent parallelisms create practical difficulties in the definition of some genera. The generic placement of certain species (particularly within *Eurybia*) will be problematic because of distinctive morphological specializations. These problems are discussed in detail elsewhere (Nesom 1994) and reflected in the artificial key provided here. In any case, the key should serve at least as a starting point for those who elect to use this taxonomic system or something similar to it. Construction of keys and the identification of genera and species groups will be considerably easier on a regional basis, just as it has been for *Aster* sensu lato. Detailed descriptions of these genera, species groups, and problematic species are found in the *Aster* review (Nesom 1994), as are authorities for all names used in the present report.

In previous keys and discussions, I have used the terms "ligule" and "achene" in reference to the expanded portion of the pistillate corollas and the fruit of Astereae. Those terms are replaced here by "lamina" and "cypsela," in acknowledgment of their more technical correctness and their ineluctable fate in forthcoming application.

KEY TO THE AMERICAN GENERA OF ASTERINAE

1. Cypselas strongly flattened with lateral wings; pappus of two lateral awns (or thickened bristles) and a series of short, highly reduced, awns or scales; disc corollas with tube 0.2-0.5 mm long and abruptly expanded into the limb, the veins accompanied by orange resin ducts.......... *Boltonia*
1. Cypselas flat to terete, without wings; pappus of barbellate bristles disc corollas with a longer tube, abruptly or gradually opening into the limb, the veins without orange resin ducts (except in *Chloracantha*). .... (2)
    2. Stems suffrutescent, usually sparsely to densely thorny, sometimes unarmed in var. *spinosa*; leaves deciduous by anthesis; heads terminal on wiry, green stems, arranged in a diffuse capitulescence; resting axillary buds with bud scales.......... *Chloracantha*
    2. Stems usually herbaceous, suffrutescent in a few species, never thorny; at least the cauline leaves persistent and present at flowering (the stems of *Oreostemma* scapose); heads variously arranged but not on wiry green stems in a diffuse capitulescence; resting buds not formed.......... (3)
3. Plants arising from long or short rhizomes and fibrous roots, not strongly woody at the base.......... (9)
3. Plants arising from a distinct taproot or thick, woody, mostly erect caudex branches.......... (4)

4. Plants perennial, usually arising from a thick taproot or thick caudex branches. ....(7)
4. Plants annual, usually arising from a slender taproot..........(5)
5. Heads and upper stems stipitate-glandular; ray cypselas epappose.. *Psilactis*, in part
5. Plants completely eglandular; ray cypselas pappose (*Symphyotrichum*, in part). .(6)
6. Phyllaries evenly herbaceous and of subequal length; pistillate flowers in 2-4 series in a broad outer zone, the lamina absent or rudimentary to filiform and short; disc (staminate) flowers fewer than the pistillate; pappus bristles in 2 series, all of equal length. ....*Symphyotrichum* sect. *Conyzopsis*
6. Phyllaries with a green, rhombic apical patch, basally indurate, graduated in length (imbricate); pistillate flowers in 1(-2) series, the lamina prominent or strongly reduced; disc flowers more numerous than the ray; pappus bristles of equal length and in a single series. ....*Symphyotrichum* sect. *Oxytripolium*, in part
7. Stems scapose, eglandular or minutely granular-glandular near the apex; heads solitary; plants arising from a thick taproot or sometimes a short rhizome.......... .... *Oreostemma*
7. Stems with well-developed cauline leaves, eglandular or densely glandular; heads solitary or few and loosely associated in a corymbiform capitulescence; plants arising from a thick taproot or thick, woody caudex branches. ....(8)
8. Stems and leaves eglandular or with short-stipitate glands; leaves 1-nerved, congested on the stems; phyllaries stiff, evidently indurate-thickened, distinctly keeled; rays mostly blue to purple; disc cypselas commonly 2-nerved, ray cypselas usually 3-4 nerved; carpopodium oblique; pappus with an outer series of bristles much shorter than the inner..........*Ionactis*
8. Stems and leaves usually with long-stipitate glands (eglandular in some species); leaves with at least the secondary veins evident, not crowded on the stems; outer phyllaries loose, foliaceous; rays yellow, white, or absent; cypselas mostly 5-8-nerved; carpopodium a symmetrical ring at right angles to the long axis of the cypsela; pappus of (1-)2 series of bristles of equal length, rarely with a shorter outer series.......... *Tonestus*
9. Phyllaries without a green apical patch. ....(14)
9. Phyllaries with a distinct, green apical patch or zone, the lower portion of the phyllary indurate. ....(10)
10. Capitulescence diffuse or the heads terminally clustered but not in a distinctly corymboid association; apical patch of phyllaries rhombic, sharply delimited at the base and basally acute or attenuate, basally truncate in some species; pappus bristles apically attenuate, in a single series. ....(12)
10. Capitulescence corymboid or reduced to glomerate clusters; apical patch of phyllaries basally truncate, sometimes not sharply delimited; pappus bristles apically dilated, in (1-)2-3 series of equal or subequal length..........(11)
11. Heads pedicellate, mostly distinct (subsessile in *Eurybia compacta*); leaves stipitate-glandular in a few species, otherwise eglandular; disc corollas yellowish; style branch appendages spreading hairy from base to tip (closely papillate in a few species); rays blue and strongly coiling, or white and non-coiling in sect. *Biotia*; cypselas narrowly cylindric, glabrous to moderately strigose. ....*Eurybia*
11. Heads sessile or subsessile in glomerate clusters; leaves sessile- or punctate-glandular; disc corollas white; style branch appendages closely papillate; rays white, not coiling; cypselas turbinate, strigose-sericeous. ....*Sericocarpus*

12. Ray cypselas epappose. .... *Psilactis*, in part
12. Ray cypselas pappose... (13)
13. Plants trailing or climbing (not twining) vines. .... *Ampelaster*
13. Plants mostly erect, sometimes leaning but never trailing or even subscandent..... .... *Symphyotrichum*, in part
14. Leaves all cauline, glabrous, linear with 3 parallel veins; pappus of a single series of equal-length, apically attenuate bristles; involucre glandular........... .... *Almutaster*
14. Leaves various but not as above; pappus bristles in (1-)2-3 series of equal length, apically dilated or attenuate; involucre glandular or eglandular. ..... (15)
15. Plants monocephalous; phyllaries evenly herbaceous, in 2(-3) series of subequal length; cypselas obovate, 2-nerved and flattened, usually sessile-glandular near the apex; pappus often with an evident short, outer series. .... *Aster alpinus*
15. Plants with two or usually more heads, or if monocephalous then without the above combination of features.. (16)
16. Leaves neither clasping nor subclasping; phyllaries usually strongly graduated in length, not foliaceous; stems, leaves, and phyllaries eglandular or sometimes sessile-glandular but without stipitate glands. .... (18)
16. Leaves clasping or subclasping; phyllaries subequal in length, at least those of the outer series foliaceous; stems, leaves, and phyllaries with stipitate glands. . ... (17)
17. Outer phyllaries foliaceous, the inner usually with a green apical patch or zone; basal leaves usually the largest, persistent; cypselas cylindric; pappus bristles usually dilated at the apex..................................... *Eurybia* sect. *Herrickia*
17. Outer phyllaries similar to the inner, herbaceous from base to apex; lowermost cauline leaves greatly reduced in size (scale-like) and not persistent; cypselas flattened; pappus bristles apically attenuate. .... *Canadanthus*
18. Phyllaries herbaceous, 1-nerved, with a green band along the midvein from base to tip, often purple-margined; basal leaves the largest, persistent; cypselas terete. .... *Aster tataricus*
18. Phyllaries usually somewhat indurate at least near the base, with 1 or more nerves, never with a medial green band; lowermost cauline leaves greatly reduced in size (scale-like); cypselas terete to flattened. .... (19)
19. Heads mostly solitary or sometimes few and in a loosely corymboid capitulescence; leaves thickened and stiff, 1-nerved, congested on the stems (internodes abbreviated); disc cypselas commonly 2-nerved, ray cypselas usually 3-4-nerved; carpopodium oblique... *Ionactis*
19. Heads in a distinctly corymboid capitulescence; leaves relatively thin and flexuous, spaced along the stem with internodes prominent, venation with at least the secondary nerves evident; all cypselas 4-9 nerved; carpopodium at right angles to the long axis of the cypsela.. (20)
20. Leaves usually sessile-glandular on the lower surface; collecting appendages of the disc style branches spreading-hairy from base to tip; cypselas densely sessile-glandular; pappus bristles apically attenuate or (in *Oclemena reticulata*) slightly dilated at the apex. .... *Oclemena*
20. Leaves not sessile-glandular, rarely short-stipitate glandular; collecting appendages of the disc style branches closely papillate at least in the distal portion; cypselas eglandular; pappus bristles usually prominently dilated at the apex. .... (21)

21. Cypselas terete or subterete, with (4-)5-9 evenly spaced, orange-resinous nerves, at maturity about the same length as the phyllaries; phyllaries oblong, not keeled, each with a midvein and 1-2 lateral pairs of nerves; eastern North America and southeastern Asia. .... *Doellingeria*
21. Cypselas distinctly flattened, with a pair of lateral nerves and sometimes 1-2 whitish, subepidermal nerves on each face, shorter than the phyllaries at maturity; phyllaries ovate to ovate-oblong, keeled, 1-nerved; western North America......... .... *Eucephalus*

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TRIDAX YECORANA (ASTERACEAE, HELIANTHEAE) A NEW SPECIES FROM SONORA, MEXICO

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ABSTRACT

Tridax yecorana B.L. Turner, *spec. nov.*, is described and illustrated. It is an annual herb known only from type material collected near Yecora, Sonora, and is related to *T. erecta*. It differs from the latter in numerous characters which are discussed in the text.

KEY WORDS: Asteraceae, Heliantheae, *Tridax*, México, Sonora, systematics

Routine identification of Mexican Asteraceae has revealed the following novelty.

TRIDAX YECORANA B.L. Turner, *spec. nov.*, Figure 1. TYPE: MEXICO. Sonora: Arroyo El Otro Lado, Mesa El Otro Lado, 1-2 km NNE of Yecora on old road to Maycoba, pine-oak forest, 28° 23′ 49″ N, 108° 54′ 48″ W, 1520 m, 7 Sep 1995, *T.R. Van Devender 95-836* (with A.L. Reina G., D.A. Yetman, and M.E. Fishbein) (HOLOTYPE: TEX).

Similis *T. erectae* A. Gray sed foliis linearibus-lanceolatis (vice foliorum ovatorum), glaberis aut sparsim glanduliferis-pubescentibus (vice hispidissimorum), involucris campanulatis (vice urceolatorum) glaberisque (vice pubescentium), acheniis rigide pubescentibus (vice molliter pubescentium), et pappis 1-2 mm longis (vice 2.5-5.0 mm).

Annual herbs 7-20 cm high. Stems mostly unbranched, sparsely pubescent with glandular trichomes 0.5-1.0 mm long. Leaves linear-lanceolate, mostly 1-2 mm wide. Heads single on peduncles, 4-15 cm long, pubescent like the stems. Involucres campanulate, 4-6 mm high, 4-9 mm wide (pressed); bracts 3-4 seriate, broadly elliptical to oblanceolate, glabrous, the apices broadly rounded, scarious. Receptacles conical, 2-3 mm across, 2.0-2.5 mm high; bracts scarious, persistent, oblanceolate to linear-oblanceolate, variously 2-3 cleft at their apices. Ray florets pistillate, fertile;

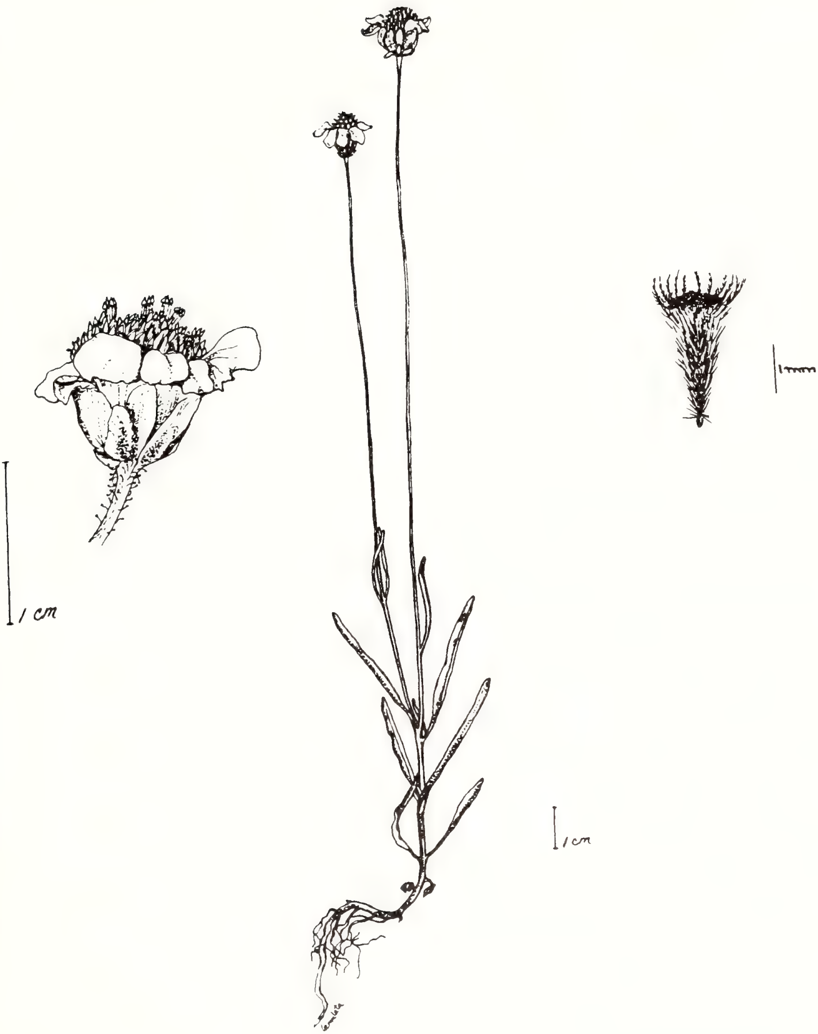

Figure 1. *Tridax yecorana*, from holotype; left, a single head; right, a disk achene.

corollas yellow; tube ca. 2 mm long, densely pilose; ligules mostly 4-5 mm long, 3-4 mm wide. Disk florets 10-25; corollas yellow, ca. 3 mm long, the tubes ca. 0.8 mm long, densely pilose; throat ca. 2 mm long, gradually ampliate upwards, the 5 lobes markedly nervate. Anthers yellow, their apices trianguloid, keeled inwardly. Achenes of disk and ray florets similar, obpyramidal, ca. 2 mm long, 0.8 mm wide, densely pubescent with stiff ascending hairs 0.5-1.0 mm long; pappus of 20 or more short plumose scales 1-2 mm long.

Tridax yecorana, in habit, superficially resembles *T. coronopifolia* H.B.K. but is clearly most closely related to *T. erecta* A. Gray, differing from the latter in having linear, nearly glabrous leaves, campanulate completely glabrous involucres, ray florets with densely villous tubes, and achenes with stiffer hairs and shorter pappus scales.

Tridax erecta (including the recently described *T. durangensis* A. Garcia Arévalo, which appears to be but a form of that species) has ovate, coarsely pubescent leaves, involucres urceolate with loose outer bracts and coarsely pubescent inner bracts, and more softly pubescent achenes with longer pappus scales.

According to label data on the type sheet, *Tridax yecorana* is a "Locally very common annual."

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SALVIA BOOLEANA (LAMIACEAE), A NEW SPECIES FROM NORTHEASTERN MEXICO

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ABSTRACT

Salvia booleana B.L. Turner *spec. nov.*, is described and illustrated. It belongs to the sect. ***Fulgentes***, a small group with about eight species, all having large red flowers (corollas mostly 3-5 cm long), where it relates to *S. fulgens* Cav. It is distinguished from the latter by numerous characters including habit, leaf shape, bract size, vestiture and distribution.

KEY WORDS: Lamiaceae, *Salvia*, sect. ***Fulgentes***, México, Nuevo León, San Luis Potosí, systematics

Routine identification of Mexican plants has revealed the following novelty.

SALVIA BOOLEANA B.L. Turner, *spec. nov.* Figure 1. TYPE: MEXICO. San Luis Potosí: Mpio. Charcas, Charcas, "on wetbank of Arroyo", Jul-Aug 1934, *C.L. Lundell 5470* (HOLOTYPE: LL!, Isotype: TEX!).

Similis *Salviae fulgenti* Cav. (*Salvia fulgens*) sed differt laminis foliorum subdeltatis, basibus foliorum plerumque cordatis, et caulibus valde glandulosis-pubescentibus, indumento 0.6-1.0 mm alto.

Perennial herbs 60-100 cm high. Stems densely glandular-hirsute, the vestiture 0.6-1.0 mm high. Midstem leaves 4-7 cm long, 2.5-4.0 cm wide; petioles 1.5-3.0 cm long; blades cordate-deltoid to subdeltoid, about as wide as long, mostly subcordate at base, pubescent like the stems, margins crenulodentate, the apices mostly obtuse. Floral bracts ovate, soon deciduous, the upper immature bracts 8-10 mm long, 2-4 mm wide, the apices gradually acuminate. Flowers (2-)4-6 to a node. Calyces mostly 11-15 mm long, glandular-pubescent; upper lobes 3-4 mm long, 9-ribbed. Corollas red to orangish-red, 3.0-4.2 cm long; upper lips 12-15 mm long; lower lips 10-12 mm long. Stamens attached near the orifice, the anthers mostly loosely exserted somewhat beyond the upper lip, rarely not, ca. 2 mm long, attached near the base (1/4 the anthers' length). Styles pubescent, the upper branches 2-3 times as long as the lower. Nutlets linear-ovoid, ca. 4 mm long, 1.5 mm wide, veinous, glabrous.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Nuevo León: Mpio. Aramberri, N of Aramberri, 995 m, 16 Jun 1990, *Hinton et al. 20340* (TEX); N of Aramberri, 970 m, 1 Sep 1990, *Hinton et al. 25019* (TEX); Sierra Vieja, 12.2 mi along dirt road turnoff to Ejido Capadero, just N of Dr. Arroyo, 6900 ft., "In dry stream bed", 20 Oct 1984, *Saunders-Scherrer 13476* (TEX).

Salvia booleana belongs to the sect. *Fulgentes* of *Salvia*, sensu Epling (1939). The nomenclatural history of this section is discussed in some detail by Ramamoorthy (1987), but no recent taxonomic study of the taxon is available, in spite of its array of attractive large red-flowered species.

Epling (1939) recognized (and keyed) six species as occurring in the section, adding an additional species with the description of *Salvia sharpii* Epling & Mathias in 1957, which is probably a weakly differentiated populational element of *S. microphylla* H.B.K. The present addition brings this total to eight, and additional species are certain to follow as Mexico becomes more thoroughly collected.

Type material of *Salvia booleana* was apparently included by Epling (1939) in his concept of *S. fulgens*, but with the comment, "Lundell's specimen from Charcas, while similar in flowers to the southern forms is markedly glandular with short-deltoid leaves." Which is certainly true; indeed, all of the specimens cited above possess such leaves and, combined with their relatively small calyces and much-reduced floral bracts, mark the plants concerned as very distinctive, certainly deserving of specific rank as morphologically defined by Epling and yet others.

Salvia booleana reportedly occurs along dry washes in relative xeric habitats from 800 to 2000 m; *S. fulgens* is a taller plant with much larger leaves occurring in mostly moist montane habitats above 2000 m (distributed from southern San Luis Potosí southwards to the states of Puebla and Morelos).

It is a pleasure to name this taxon for George Boole Hinton (great grandson of the late renown Mexican collector, George Boole Hinton), frequent companion on field forays with Jaime and Jorge Hinton, son and grandson, respectively of the primal sire, G.B. Hinton. A photograph of this young Hinton can be found in Turner (1996). My principal reason for selection of the epithet concerned is to establish a familial record of sorts: five names from a male lineage representing four generations, all included in the same genus. These include:

1. *Salvia hintonii* Epling - named for G.B. Hinton, the father.
2. *Salvia jacobi* Epling - for James Hinton, the son (pers. comm., James Hinton)
3. *Salvia jaimehintoniana* Ramamoorthy - honoring James Hinton, the son.
4. *Salvia jorgehintoniana* Ramamoorthy - honoring George Hinton, the grandson.
5. *Salvia booleana* B.L. Turner - honoring George Boole Hinton, the great grandson.

And this does not include *Salvia leninae* Epling, named for a remarkable pack animal of the Hinton's, a mule named Lenina. *Salvia*, with 500 or more species, can comfortably ingest such effrontery. What I like about the eponyms concerned is that most of the species (all except *S. jacobi* and *S. hintonii*) occur in the state of Nuevo León, and the surviving kin of G.B. Hinton, all residing in Nuevo León on their

Rancho Aguililla, are now surrounded by floristic "headstones" that will extend far beyond their natural lives. I like that kind of perpetuity for such dedicated workers!

ACKNOWLEDGMENTS

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A NEW SPECIES OF *LOBELIA* (CAMPANULACEAE) FROM OAXACA, MEXICO

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ABSTRACT

Lobelia hintoniorum B.L. Turner, *spec. nov.* from Distrito Miahuatlán, Oaxaca, is described and illustrated. It belongs to the sect. *Hemipogon*, subsect. *Leiospermae*, where it relates to *L. occidentalis* McVaugh. It differs from the latter in possessing very large dark blue corollas and nonhispidulous anthers.

KEY WORDS: Campanulaceae, *Lobelia*, México, Oaxaca, systematics

Routine identification of Mexican lobelioids has revealed the following novelty.

LOBELIA HINTONIORUM B.L. Turner, *spec. nov.* Figure 1. TYPE: MEXICO. Oaxaca: Distrito Miahuatlán, S side of Cerro Quiexobra, 1-3 km NE of La Cieneguilla on road to summit, in damp ravines below understory of pine-oak forests, 2900 m, 2 Oct 1990, *Andrew McDonald 2982* (HOLOTYPE: TEX).

Similis *L. occidentali* McVaugh & Huft sed foliis midcaulis majoribus, ([6-]12-15 cm longis vice 4-10 cm longis), pedunculis valde majoribus (5-6 cm longis vice 2.5-4.0 cm longis), tubis corollarum longioribus (12-15 mm longis vice 7-9 mm longis), et sacculis superis antherarum glabris (vice sacculorum hispidorum).

Weakly ascending or procumbent herbs to 60 cm high arising from slender rhizomes, forming colonies. Midstems 1-3 mm across, glabrous. Midstem leaves glabrous, mostly linear to linear-lanceolate, gradually reduced upwards, (5-)6-15 cm long, 0.3-0.7 cm wide, remotely denticulate. Inflorescence of (2-)5-25 flowers, when numerous the latter disposed in a secund fashion. Bracts linear, mostly 1/2 as long as the pedicels, or more. Pedicels of mature flowers mostly upwardly arcuate, 2-6 cm long. Ovary ca. 1/3 to 1/2 inferior, the calyx cup ca. 2 mm high, glabrous, the lobes

Figure 1. *Lobelia hintoniorum*, from holotype.

linear-lanceolate, 4-6 mm long, reflexing with age. Corollas dark blue, the tubes 12-16 mm long, not fenestrate, the dorsal slit 9-11 mm deep; upper two lobes linear-lanceolate, 6-8 mm long; lower 3 lobes neatly elliptical, 7-10 mm long, 2.5-4.0 mm wide. Filaments ca. 10 mm long, united for ca. 4 mm apically; anthers 3-4 mm long, the lower 2 tufted, otherwise glabrous. Fruits not available.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Oaxaca: Distrito Miahuatlán, Quiexobra, 2920 m, 14 Oct 1995, *Hinton et al. 26104* (TEX); Siete Ocotes, 2950 m, 20 Oct 1995, *Hinton et al. 26256* (TEX); Siete Ocotes, 2880 m, *Hinton et al. 26265* (TEX).

Lobelia hintoniorum clearly belongs to the sect. *Hemipogon* subsect. *Leiospermae* (sensu Wimmer 1953) where it relates to *L. occidentalis* McVaugh and *L. dielsiana* Wimmer. McVaugh (1975) provided a detailed key to both of these taxa. In this, *L. hintoniorum*, because of its very large corollas, will key to *L. sublibera* S. Wats., a very distinctive species confined to northeastern México (Nuevo León and Tamaulipas). *Lobelia hintoniorum* has the habit, leaves, and general inflorescence of *L. occidentalis*, but differs in the characters called to the fore in my diagnosis.

It is a pleasure to name this taxon for the Hinton family, who collected three of the only four collections known to me. Label data on the Hinton material report the species to form scattered but common procumbent plants or colonies to 60 cm high. *Hinton 26104* is a depauperate plant with relatively small leaves, but its flowers are typical of the taxon concerned.

The type of *Lobelia hintoniorum* was obtained by Andrew McDonald in 1990 (from among whose many collections I named *Lobelia macdonaldii* B.L. Turner), but this collection remained unnamed awaiting additional material. The several Hinton specimens cited above leave little doubt that the taxon is quite distinct and undescribed.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Ted Delevoryas for reviewing the manuscript. Ms. Maria Thompson provided the illustration.

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A NEW SPECIES OF *VERBESINA* (ASTERACEAE) FROM OAXACA, MEXICO

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ABSTRACT

Verbesina miahuatlana B.L. Turner *spec. nov.*, is described and illustrated from Distrito Miahuatlán, Oaxaca. It is known only from two collections, both obtained in pine-oak forests between 2700-2825 m. It belongs to the *Verbesina virgata* complex (ca. eight species) but can be distinguished from all of these by its much larger coarsely serrate leaves and loosely corymbose paniculate capitulescence.

KEY WORDS: Asteraceae, *Verbesina*, México, Oaxaca, systematics

Routine identification of Mexican Asteraceae has revealed the following novelty.

VERBESINA MIAHUATLANA B.L. Turner, *spec. nov.* TYPE: MEXICO. Oaxaca: Distrito Miahuatlán, Xianaguilla, 2700 m, oak and pine forests, 21 Oct 1995, *Hinton et al. 26294* (HOLOTYPE: TEX).

Similis *V. virgatae* sed foliis latioribus (3-9 cm latis vice 1.5-2.5 cm latis), cum marginibus valde serratis, et capitulis parvioribus, dispositis in paniculis rotundatis et corymbosis, pedunculis ultimis gracilibus et flexuosis (vice crassorum et rigide erectorum).

Shrub to 2.5 m high. Stems sparsely strigose, narrowly corky winged for 1-3 cm below each node. Larger leaves alternate, 9-24 cm long, 3-8 cm wide; petioles 5-20 mm long; blades pinnately nervate, broadly ovate to elliptic, gradually tapering upon the petioles, sparsely strigose above and below, especially along the major veins, the margins irregularly serrate. Heads numerous, arranged in terminal corymbose panicles, scarcely exceeding the leaves, the ultimate peduncles mostly 5-15 mm long. Involucres broadly campanulate, 4-5 mm high, 6-8 mm wide (pressed); bracts 2-4 seriate, narrowly ovate, subgraduate, black, the apices acute. Receptacle ca. 2 mm across, 1 mm high, the chaff shorter than the subtended florets, their apices abruptly acute. Ray florets 5-8, pistillate fertile; ligules yellow, 6-9 mm long, 2-3 mm wide, 4-6 nervate, their apices with 2-3 shallow lobes; tubes ca. 1.5 mm long, pubescent.

Disk florets 30-40 (est.); corollas yellow, ca. 3 mm long, the tube ca. 0.75 mm long, pubescent; lobes glabrous, ca. 0.7 mm long. Anthers brown. Achenes ca. 2 mm long, the faces sparsely strigose, the margins ciliate; pappus of 2 subequal persistent awns ca. 2 mm long.

ADDITIONAL SPECIMEN EXAMINED: MEXICO. Oaxaca. Distrito Miahuatlán, Siete Ocotes to Xianaguilla, 2825 m, 21 Oct 1995, *Hinton et al. 26277* (TEX).

The present novelty is closely related to a group of species centering about the widespread *Verbesina virgata.* The distribution of this complex is shown in more detail by Turner (1992). *Verbesina miahuatlana* differs from these in possessing broader leaves, more numerous heads arranged in rounded corymbose panicles, and having black, broadly campanulate involucres, among yet other characters.

The holotype represents a lush collection with very large leaves, while the additional collection has much smaller, less serrate leaves, but in all other characters the two plants are alike and unquestionably belong to the same species.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Justin Williams for reviewing the paper.

LITERATURE CITED

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Phytologia (October 1995) 79(4):298-300.

A NEW SPECIES OF *MENTZELIA* (LOASACEAE) FROM NUEVO LEON, MEXICO

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ABSTRACT

Mentzelia hintoniorum B.L. Turner & Hempel, *spec. nov*, is described and illustrated. It is known only from gypseous soils near San Roberto, Mpio. Galeana, Nuevo León. The taxon belongs to the sect. *Bartonia* and is seemingly most closely related to *M. mexicana* but is distinguished from that species by numerous features including habit, vestiture, and flower size.

KEY WORDS: Loasaceae, *Mentzelia*, México, Nuevo León, systematics

Routine identification of Mexican plants has revealed the following novelty.

MENTZELIA HINTONIORUM B.L. Turner & Hempel, *spec. nov.* Figure 1. TYPE: MEXICO. Nuevo León: Mpio. Galeana, San Roberto to "Y," (24° 41′ 55″ N, 100° 10′ 34″ W) 2015 m, gypsum hillside, 5 Sep 1995, *Hinton et al. 25495* (HOLOTYPE: TEX).

Similis *M. mexicanae* M.J. Thompson et Zavort. sed caulibus rectis, non ramosis infra, em corona radicum lignearum exorientibus, et floribus majoribus, petalis plerumque 20-22 mm longis (vice 10-15 mm longis), staminibus exterioribus ca. 13 mm longis (vice ca. 9 mm longis).

Simple-stemmed (or sparsely branched following injury) perennial herbs ca. 30 cm high, arising from the crown of woody roots. Stems straight, not at all fractiflex, ca. 3 mm across at midstem, moderately pubescent with stiff, multiseptate, glochidiate hairs, forming a vestiture ca. 0.5 mm high. Leaves linear-oblanceolate, not clearly petiolate, gradually reduced upwards, those at midstem mostly 3-4 cm long, 4-7 mm wide, pubescent like the stems, but sparsely so, and the surfaces mostly glabrous, the margins with 3-7 shallow lobes. Flowers 1-3, terminal. Calyx cup at anthesis 3-5 mm high; lobes lanceolate, ca. 12 mm long, 2.5 mm wide at base, fused below for

Figure 1. *Mentzelia hintoniorum*, from holotype

1.5-2.0 mm, pubescent like the stems. Petals 10, yellow, 20-22 mm long, ca. 5 mm wide, gradually tapered from above into a narrow claw ca. 8 mm long. Stamens numerous, 10-13 mm long, the outermost anthers borne on narrow filaments. Capsules 20-25 mm long, 8-10 mm wide (pressed); lobes 4-6 mm long. Seeds white, smooth, 2.5-3.0 mm long, ca. 2 mm wide; wings ca. 0.5 mm wide.

Mentzelia hintoniorum is closely related to *M. mexicana* Thompson & Zabort. of the sect. *Bartonia* (*cf.* Thompson & Powell 1981). It is readily distinguished from *M. mexicana* by its unbranched straight stems which arise from the crown of woody tap roots (vs. much-branched stems from tough but scarcely woody tap roots), more prominent stem-hairs, the vestiture ca. 0.5 mm high, lacking an understory of minute hairs (vs. vestiture ca. 0.25 mm high and minutely pubescent beneath), and much larger petals (20-22 mm long vs. 10-15 mm long).

Thompson & Powell (1981) provided a detailed account of *Mentzelia mexicana* and closely related taxa, mapping the distribution of each taxon. None of these was shown to occur in Nuevo León. *Mentzelia hintoniorum* occurs in a region of Nuevo León (near San Roberto) where numerous gypseous endemics occur, the present apparently being yet another.

It is a pleasure to honor the remarkable Hinton clan with this rare novelty, the collectors noting the taxon to be represented by only "a few plants." at the locality concerned, which is very near the type locality of the localized *Arenaria hintoniorum* B.L. Turner.

ACKNOWLEDGMENTS

We are grateful to Gayle Turner for the Latin diagnosis, and to her and Ted Delevoryas for reviewing the paper. Maria Thompson provided the illustration.

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Phytologia (October 1995) 79(4):301-302.

A NEW SPECIES OF *STEVIA* (ASTERACEAE) FROM CERRO QUIEXOBRA, OAXACA, MEXICO

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ABSTRACT

Stevia quiexobra B.L. Turner, *spec. nov.* is described from Cerro Quiexobra, Oaxaca, México, where it occurs in pine-fir forests at ca. 3400 m.

KEY WORDS: Asteraceae, *Stevia*, México, Oaxaca, systematics

Stevia is represented in México by numerous species, most of these treated by Grashoff (1972). Since the latter's treatment, numerous additional species have been added, the most recent being those of Turner (1995) and Yahara & Soejima (1995). I add here a newly discovered taxon from Cerro Quiexobra, Oaxaca.

STEVIA QUIEXOBRA B.L. Turner *spec. nov.* TYPE: MEXICO. Oaxaca: Distrito Miahuatlán, Cerro Quiexobra, 3385 m, "steep fir and pine woods", 15 Oct 1995, *Hinton et al. 26141* (TEX).

Similis *S. perfoliatae* Cronq. sed foliis non perfoliatis et achenibus exaristatis.

Perennial rhizomatous herbs 20-30 cm high. Stems with a dense vestiture of glandular-capitate trichomes about 0.5 m high. Leaves mostly opposite (except for 3-5 uppermost leaves), gradually reduced upwards. Midstem leaves ovate to ovate-elliptic, sessile or nearly so, widest at or about the middle, 3-4 cm long, 1.0-1.8 cm wide, with 3 principal nerves arising from above the base, glandular-punctate on both surfaces, glandular pubescent like the stems, the margins weakly crenate. Heads arranged in bracteate congested glomerules ca. 1.5 cm high, 1.5 cm across. Subtending bracts glandular pubescent, similar to the involucral bracts. Involucres ca. 7 mm high, sparsely glandular pubescent to glabrous. Corolla tubes ca. 5 mm long, sparsely pubescent; lobes 1.5-2.0 mm long, sparsely pubescent on the outer surfaces. Achenes (immature) all alike, ca. 4.5 mm long, glabrous except for a few hispid hairs near the apices; pappus a crown of short scales ca. 0.75 mm high.

This taxon is known only by the type; label data note it to occur as "thin colonies 0.3 m high." Because of its broad sessile glandular pubescent leaves, *S. quiexobra* is readily distinguished from most other Mexican taxa. It is seemingly most closely related to *S. perfoliata* Cronq., but lacks the perfoliate leaves and aristate achenes of that species.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Ted Delevoryas for reviewing the paper.

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Yahara, T. & A. Soejima. 1995. A new species of *Stevia* from México. Phytologia 79:35-37.

Phytologia (October 1995) 79(4):303-305.

STELLARIA MIAHUATLANA (CARYOPHYLLACEAE), A NEW SPECIES FROM OAXACA, MEXICO

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ABSTRACT

Stellaria miahuatlana B.L. Turner, *spec. nov.*, is described from Distrito Miahuatlán, Oaxaca, México. It is closely related to *S. irazuensis* but differs in its 5-parted calyx, larger corollas and much larger leaves.

KEY WORDS: Caryophyllaceae, *Stellaria*, México, Oaxaca, systematics

Routine identification of Mexican plants has revealed the following novelty.

STELLARIA MIAHUATLANA B.L. Turner, *spec. nov.* Figure 1. TYPE: MEXICO. Oaxaca: Distrito Miahuatlán, above Xianaguilla, 2510 m, "mixed woods of oak, pine, arbutus...Common", 24 Oct 1995, *Hinton et al. 26426* (TEX).

Similis *S. irazuensis* Donn. Sm. sed calycibus cum 5 lobis (vice 4), corollis majoribus, ca. 9 mm longis (vice 3-6 mm longis), et foliis majoribus cum laminis 30-40 mm latis (vice 10-20 mm).

Sprawling perennial (?) herbs to 0.4 m high. Younger stems mostly pilose; older stems glabrate and shiny, the internodes mostly 2-3 times as long as the leaves. Stipules absent. Midstem leaves (4-)5-6 cm long; petioles 1.0-2.5 cm long, pilose; blades cordate, 3.0-4.5 cm long, 3.0-3.5 cm wide, more or less glabrous on both surfaces, the margins and veins sparsely pilose. Flowers 5-10, mostly axillary in bracteate dichasial cymes, rarely solitary. Pedicels mostly 1.5-2.0 cm long, densely glandular-pilose. Sepals 5, ovate-lanceolate, 4-5 mm long, ca. 1.5 mm wide, sparsely pilose below, the margins white-scarious. Petals 5, white, ca. 9 mm long, deeply cleft for 4-5 mm, the lobes linear to linear-oblanceolate, weakly nervate, if at all. Stamens 10, ca. 4 mm long, the anthers white. Style branches 3, ca. 4 mm long, free to the base. Capsules (immature) ca. 4.5 mm long, the young seeds numerous and peripherally ornate with bulging cells.

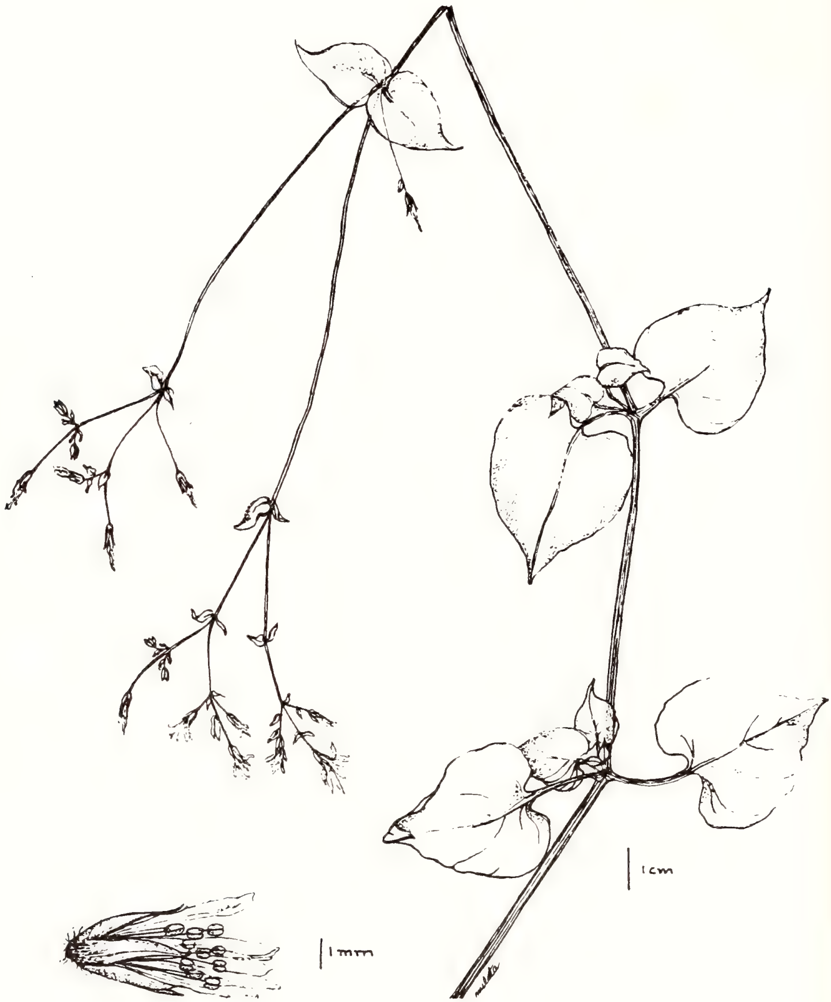

Figure 1. *Stellaria miahuatlana*, from holotype.

This taxon, because of its inflorescence, glandular-villous pedicels and markedly cordate leaves, appears to be closely related to *Stellaria irazuensis* Donn. Sm. a species of Central America (Guatemala to Panamá), nicely illustrated by Duke (1961) in his treatment of *Stellaria* for Panamá. *Stellaria miahuatlana* is readily distinguished from *S. irazuensis* in having larger more broadly cordate blades (30-35 mm wide vs. 5-15 mm wide) mostly 5 sepals (vs. 4 sepals), and larger petals.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Ted Delevoryas for reviewing the manuscript.

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A NEW SPECIES OF *CYNOGLOSSUM* (BORAGINACEAE) FROM OAXACA, MEXICO

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ABSTRACT

Cynoglossum hintoniorum B.L. Turner, *spec. nov.*, is described and illustrated from high elevational regions on and about Cerro Quiexobra, Oaxaca. It is closely related to *C. amabile*, but differs markedly from that species in possessing mericarps with relatively few smooth elongate spines, otherwise they appear very similar.

KEY WORDS: Boraginaceae, *Cynoglossum*, México, Oaxaca, systematics

Identifications of collections from Cerro Quiexobra, Oaxaca, and immediate environs has revealed the following novelty.

CYNOGLOSSUM HINTONIORUM B.L. Turner, *spec. nov.* TYPE: MEXICO. Oaxaca: Distrito Miahuatlán, Cerro Quiexobra, 3145 m, 19 Oct 1995, *Hinton et al. 26206* (HOLOTYPE: TEX).

Similis *C. amabili* Stapf & Drumm. sed mericarpiis cum solum 10-15 spinis elongatis laevibusque (vice spinarum multarum, brevium, et muricatarum).

Erect perennial herbs 20-60 cm high, arising from stout ligneous taproots. Basal leaves mostly 10-18 cm long, 1.5-3.0 cm wide; petioles 3-6 cm long; blades narrowly elliptic, widest at or near the middle, pinnately veined, moderately pilose above and below, strigose along the major veins, the surfaces minutely atomiferous-glandular, the margins entire. Midstem leaves 5-10 cm long, 1-3 cm wide, the petioles winged throughout, tapered upon by the blades. Flowers terminal, arranged in scorpioid-racemic inflorescences 10-20 cm long, the pedicels 2-5 mm long, recurved in fruit. Sepals ovate-lanceolate, ca. 3 mm long, strigose externally, free to the base or nearly so. Corollas blue, 8-10 mm across, the throat nearly closed by hispidulous bilobate appendages. Stamens 5, nearly sessile, the anthers ca. 1 mm long, not excurrent.

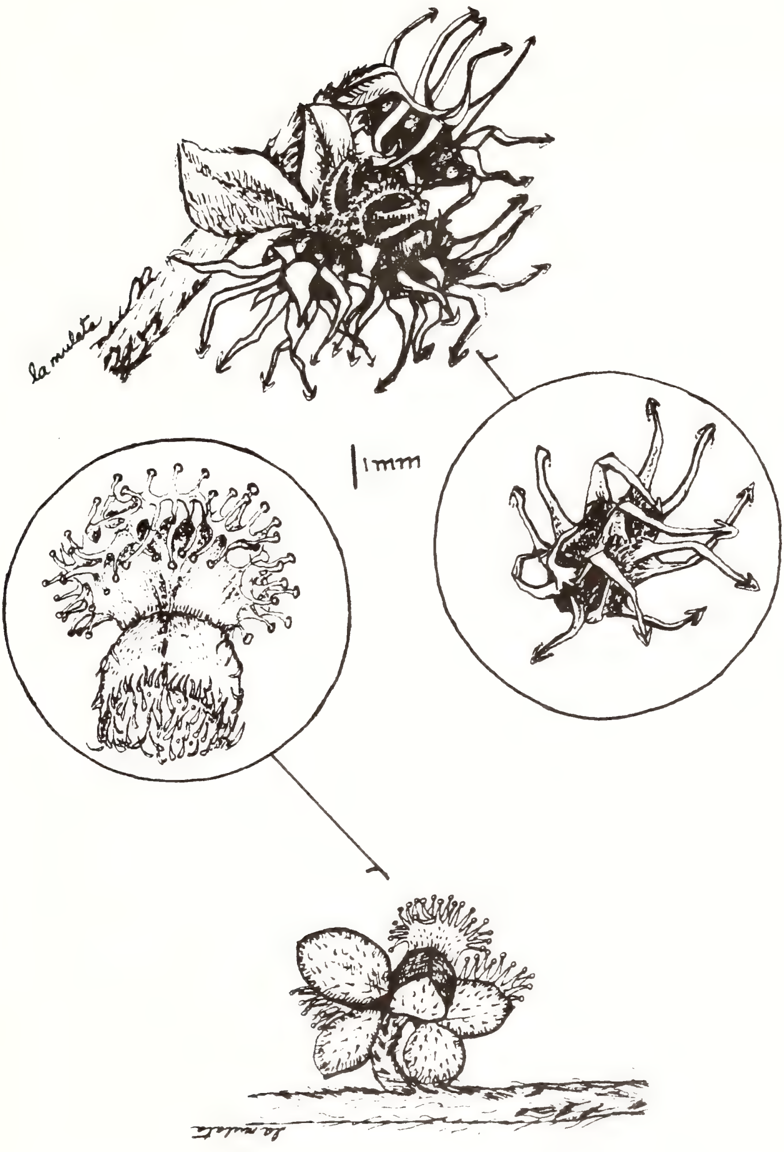

Figure 1. Mericarps of *Cynoglossum amabile* (lower left, *Webster 11327* [TEX]) and *C. hintoniorum* (upper right, from holotype).

Style ca. 3 mm long, the stigmatic surface more or less peltate. Mericarps (3 of them), each with 10-15 long flattened smooth spines, 3-4 mm long, their apices with 2-4 hooked hairs, 1 of the mericarps tending to abort, nearly rugose, not at all spinose or very weakly so.

ADDITIONAL SPECIMEN EXAMINED: MEXICO. Oaxaca: Distrito Miahuatlán, Xianaguilla, 2715 m, oak and pine forest, 13 Oct 1995, *Hinton et al. 26063* (TEX).

This taxon has most of the characters of *Cynoglossum amabile* Stapf & Drumm., except for the markedly different fruits, as shown in Figure 1. Examination of 30 or more sheets of *C. amabile* (LL, TEX) from both México and Central America revealed no fruits remotely approaching those of *C. hintoniorum.*

Mexico is now known to have four species of *Cynoglossum*: *C. amabile*, *C. henricksonii* Higgins (=*C. erectum* Higgins 1976, not *C. erectum* Sweigg *ex* Schrank 1822), *C. hintoniorum*, and *C. pringlei* Greenm. *Cynoglossum amabile* is said to be native to China, being introduced into México and elsewhere in Central and South America (*cf.* Nash & Moreno 1981, who provided an excellent illustration). Brand (1921), however, does not note a New World distribution in his treatment. Apparently *C. amabile* is used as a folk medicinal, having largely spread throughout the tropical and subtropical regions of the New World over the past 50 years (it was not described as new to science until 1906). Gibson (1970) thought the plant to be largely cultivated for ornamental purposes in Guatemala, the very adherent seeds readily dispersed by mammals, including man. Finally, it should be noted that *C. hintoniorum* may be a stabilized or populational fruit-form of *C. amabile*; if so, it is a remarkable populational variant, especially since it occurs at two distant locales in Miahuatlán at very high elevations (2715-3145 m) in regions relatively remote from human population centers.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Ted Delevoryas for reviewing the manuscript. Marcia Thompson provided the illustration.

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Phytologia (October 1995) 79(4):309-312.

TWO NEW SPECIES OF *AGERATINA* (ASTERACEAE) FROM MEXICO

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ABSTRACT

Two new species of *Ageratina* are described from México: ***A. ayerscottiana*** B.L. Turner, from the vicinity of Basaseachi, Chihuahua; and ***A. miahuatlana*** from Oaxaca. The former belongs to the subgenus *Neogreenella* and relates to *A. petiolaris*; the latter belongs to the subgenus *Ageratina* and relates to *A. viscosissima*. A map showing the distribution of *A. ayerscottiana* and *A. petiolaris* is provided.

KEY WORDS: Asteraceae, Eupatorieae, *Ageratina*, Mexico, Chihuahua, Oaxaca, systematics

The genus *Ageratina* is a segregate from *Eupatorium* (s.l.). It is a large highly variable complex in Mexico, 110 or more species currently recognized (*cf.* Turner & Nesom 1993). The present account, along with others described since the 1993 survey, adds two additional species, bringing to ca. 125 the number currently recognized for México (Turner 1996).

AGERATINA AYERSCOTTIANA B.L. Turner, *spec. nov.* TYPE: MEXICO. Chihuahua: 1 mi N. of Maguarachi, ca. 22 mi S of junction with Basaseachi-San Juanito road, "steep S-facing cliff in drainage," ca. 6000 ft, May 1984, *T.J. Ayers 399*, with *R. Scott* (HOLOTYPE: TEX!)

Similis *A. petiolari* (DC.) R.M. King & H. Rob. sed foliis parvioribus cum venatione valde elevata et sine trichomatibus glandulosis.

Suffruticose herbs or shrublets. Young stems densely hirsute with white eglandular hairs. Leaves opposite throughout; uppermost leaves thick and strongly venose beneath; petioles 10-15 mm long; blades neatly cordate, 2-3 cm long, 2-3 cm wide, 3-5 nervate from the base, densely hirsute above and below with eglandular hairs, the surfaces densely atomiferous-glandular, the margins crenulate. Heads terminal, arranged 30-100 in rounded corymbose capitulescences, the ultimate peduncles mostly 5-15 mm long. Involucres campanulate, 5-6 mm high, ca. 10 mm

wide (pressed); bracts linear-lanceolate in ca. 2 series, pubescent with eglandular hairs, the surfaces atomiferous-glandular. Receptacles convex, ca. 4 mm across, 1.5 mm high, glabrous. Disk florets 50 or more (est.); corollas white, 4-5 mm long, glabrous; tubes ca. 2 mm long; lobes ca. 0.5 mm long, atomiferous-glandular, but without hairs. Achenes ca. 3 mm long, hispidulous; the pappus of ca. 20 barbellate bristles 5 mm long in a single series.

ADDITIONAL SPECIMEN EXAMINED: MEXICO. Chihuahua: just E of Maguarachi on road between Basaseachi and San Juanito, headwaters of the Río Oteros, "steep sided mountain slopes in narrow arroyo," 17 May 1984, *Lavin 5427* (TEX), with *R. Scott et al.*

This taxon belongs to the subgenus *Neogreenella* (*sensu* King & Robinson 1987), superficially resembling *Ageratina petiolaris* (DC.) King & H. Rob. It is amply distinct from the latter by a number of characters, most notably through the absence of glandular trichomes, and by the seemingly smaller, thicker more venous leaves. I retained such plants under my concept of *A. petiolaris* for several years, but closer inspection has suggested that these are deserving of specific status. The distributional relationship of *A. ayerscottiana* and *A. petiolaris* is shown in Figure 1.

It is a pleasure to name this isolated species in honor of Dr. Tina Ayers and her husband Dr. Randy Scott, both having participated in the collection of the only two specimens known to me. Tina and Randy obtained their doctorates under my direction, and are currently located at Northern Arizona University, Flagstaff, Arizona. Their wedded name also appears on one other Mexican species, *Wedelia ayerscottiana* B.L. Turner.

AGERATINA MIAHUATLANA B.L. Turner, *spec. nov.* TYPE: MEXICO. Oaxaca: Distrito Miahuatlán, Quiexobra, 3050 m, 22 Oct 1995, *Hinton et al. 26304* (HOLOTYPE: TEX!).

Similis *A. viscosissimae* (Rolfe) R.M. King & H. Rob. sed involucris majoribus (10-12 mm altis vice 6-8 mm altis) et setis papporum pluribus (ca. 30 vice 10-15).

Suffruticose herbs or shrublets 0.5-1.2 m high. Midstems 3-5 mm across, densely pubescent with a vestiture of glandular trichomes ca. 0.25 mm high. Leaves opposite throughout, but occasionally the uppermost alternate; those at midstem mostly cordate; petioles 2-3 cm long; blades 5-7 cm long, 4-7 cm wide, thin, 3-nervate from the base, moderately to sparsely pubescent above and below, the margins crenulodentate. Heads arranged in relatively loose terminal cymes, the ultimate peduncles mostly 1-3 cm long, pubescent like the stems. Involucres campanulate, 11-12 mm high; bracts linear-lanceolate, 2-3 seriate, subequal, glandular-pubescent, the apices narrowly acute. Florets 20-30 per head (est.); corollas white, 6-7 mm long, glabrous except for the sparsely pilose lobes. Achenes (immature) ca. 3 mm long, hispidulous; pappus of ca. 30 readily deciduous white bristles ca. 6 mm long.

ADDITIONAL COLLECTIONS EXAMINED: MEXICO. Oaxaca: Distrito Miahuatlán, Xianaguilla, 2715 m, 13 Oct 1995, *Hinton et al 26062* (TEX); Siete Ocotes, 2950 m, 20 Oct 1995, *Hinton et al. 26258* (TEX).

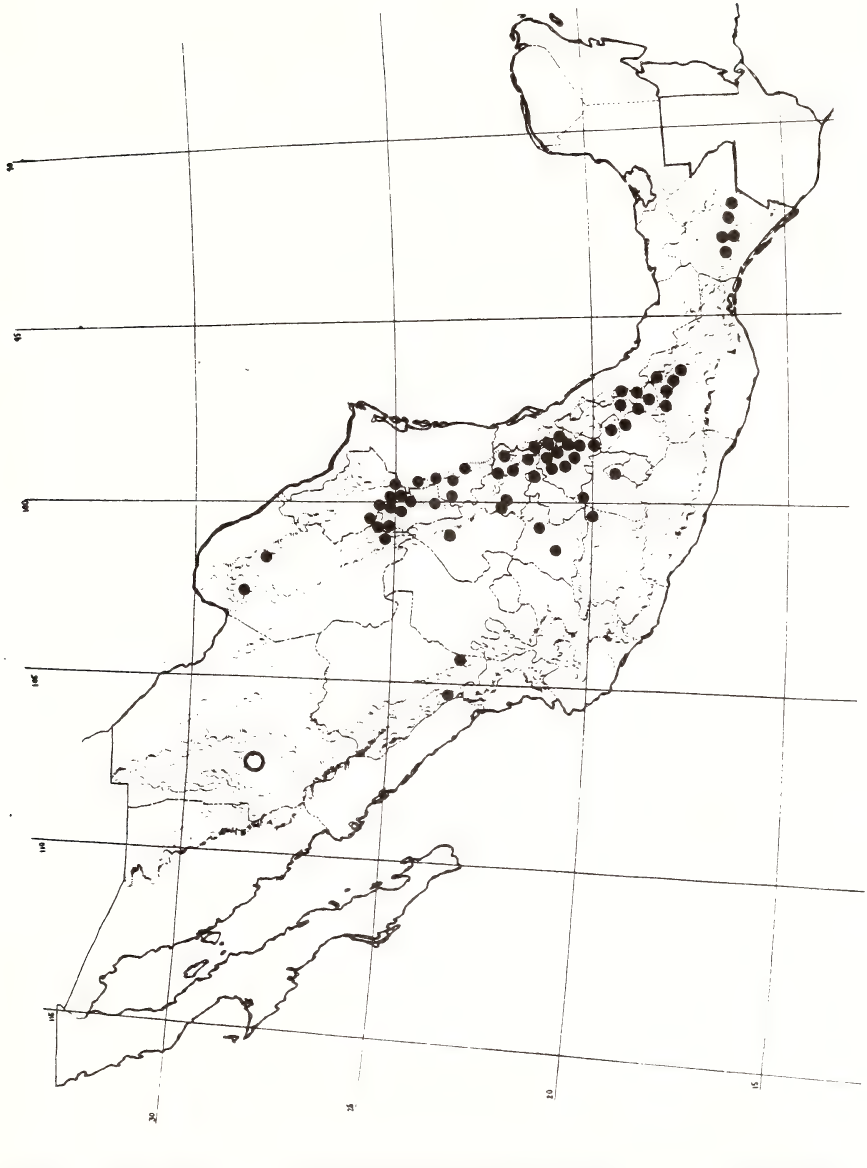

Figure 1. Distribution of *Ageratina petiolaris* (closed circles) and *A. ayerscottiana* (open circle). Based upon specimens at LL, TEX.

Ageratina miahuatlana relates to a group of species with large heads and glandular - pubescent foliage centering about *A. viscosissima* (Rolfe) King & H. Rob. The latter occurs in northwestern México and belongs to the subgenus *Ageratina* (sensu King & Robinson 1987). It differs from the latter in having leaves with shorter petioles and larger heads, the involucres 10-12 mm long (vs. 6-8 mm long), and pappus of more numerous bristles (ca. 30 vs. 10-15).

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnoses, and to her and Justin Williams for reviewing the paper.

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A NEW SPECIES OF *BOCCONIA* (PAPAVERACEAE) FROM OAXACA, MEXICO

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ABSTRACT

Bocconia hintoniorum B.L. Turner, *spec. nov.*, is described and illustrated from Cerro Quiexobra, Distrito Miahuatlán, Oaxaca. It is a small tree 3-5 m high having undivided, thick coriaceous leaves, and flowers with 7-8 anthers. It is closely related to the more southern *B. gracilis*, differing from the latter in having smaller, thicker leaves with minutely crenulodentate margins and fewer anthers.

KEY WORDS: Papaveraceae, *Bocconia*, México, Oaxaca, systematics

Routine identification of Mexican plants has revealed the following novelty.

BOCCONIA HINTONIORUM B.L. Turner, *spec. nov.* Figures 1-2. TYPE: MEXICO. Oaxaca: Distrito Miahuatlán, Cerro Quiexobra, 3070 m, 19 Oct 1995, *Hinton et al. 26227* (HOLOTYPE: TEX).

Similis *Bocconiae gracili* Hutch. sed foliis crassioribus glabrisque, marginibus uniformiter minuteque crenulatis-dentatis, et antheris 7-8 (vice ca. 12).

Small tree 3-5 m high. Young stems densely hirsute. Leaves 12-13 cm long, 2-3 cm wide, pubescent at the base like the stem, often winged throughout by the gradually tapering blades, the latter narrowly elliptic to elliptic-oblanceolate, pinnately nervate, the margins minutely crenulodentate for about 2/3 of their length. Flowers arranged in terminal panicles ca. 30 cm long, 10 cm across, the pedicels mostly 4-10 mm long, glabrous. Sepals 9-11 mm long, 2.5-3.0 mm wide, the apices abruptly constricted forming a lanceolate extension ca. 2 mm long. Petals absent. Stamens 7 or 8. Fruits on recurved pedicels at maturity, glaucous-black, glabrous. Seeds ovoid, ca. 4 mm long, 3 mm across, the caruncle broadly conical, ca. 2 mm long.

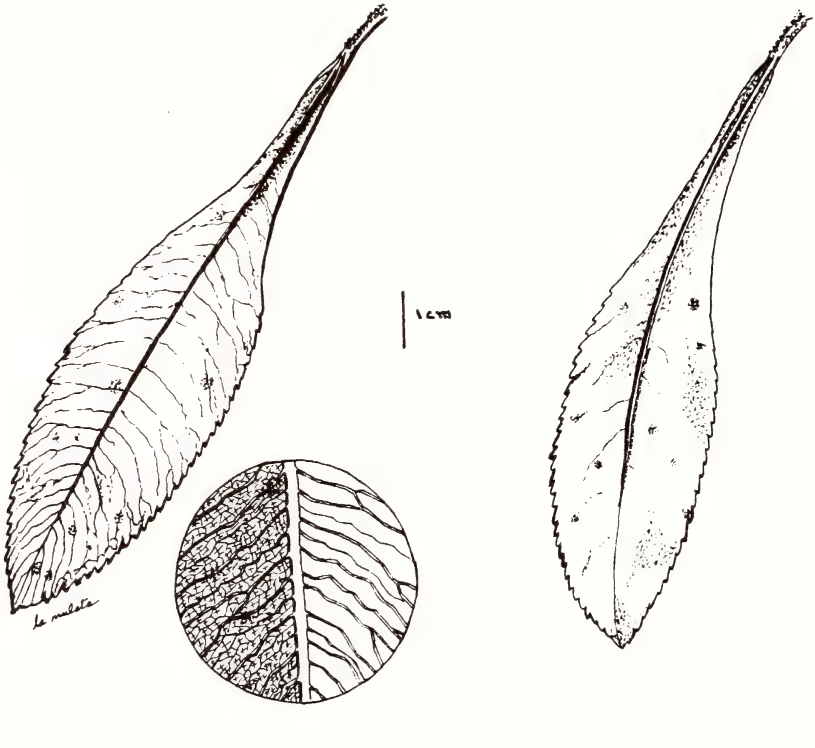

Figure 1. Leaves of *Bocconia hintoniorum*: left side (lower surface); right side (upper surface); circular inset (undersurface, showing detail); from holotype.

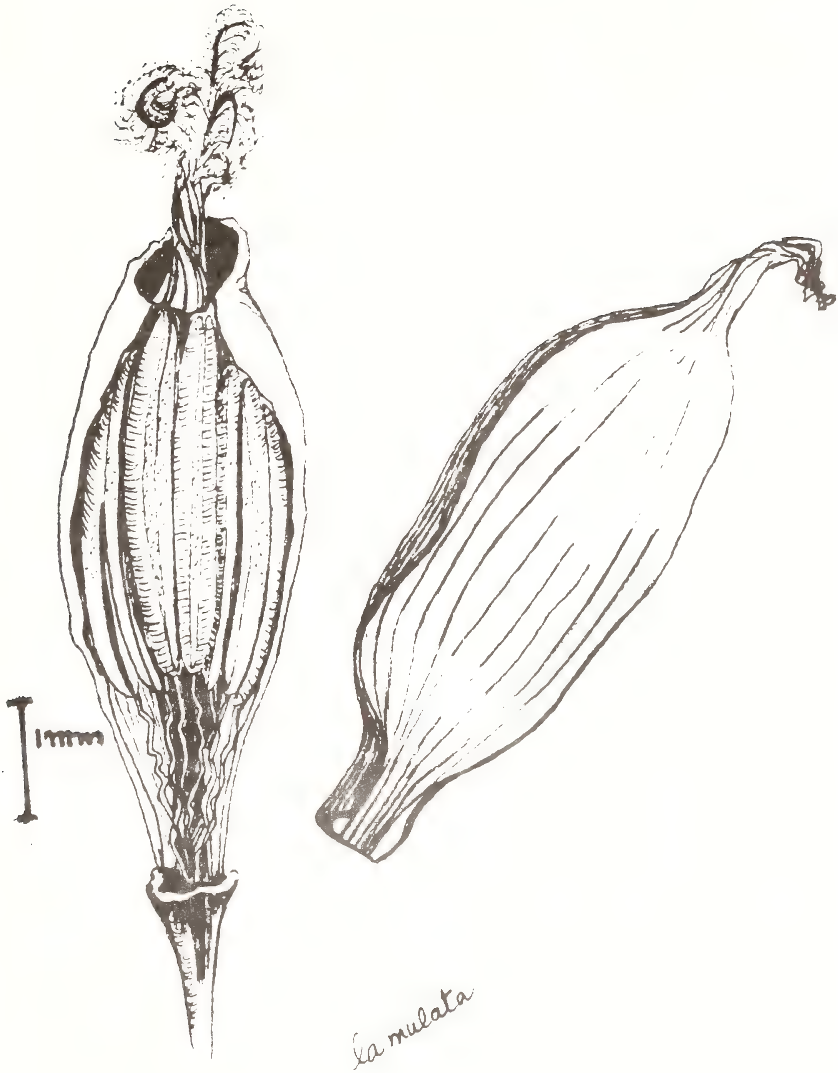

Figure 2. Flower of *Bocconia hintoniorum* with one of the two sepals removed (from holotype).

This newly described taxon first came to my attention in the fall of 1980 while on a *Bocconia* collecting expedition with Ms. Joan Johnson (accompanied by Dr. David Northington and Dr. Wayne Elisens). Ms. Johnson was in the early stages of a doctoral systematic study of *Bocconia*, having borrowed a wide range of material from various institutions so as to prepare herself for the field trip concerned. We collected the commonly occurring bocconias throughout most of México (mainly *B. frutescens* L., including *B. latisepala* S. Wats.), but were startled to find small populations of the presently described species along highway 175 in the vicinity of Miahuatlán, Oaxaca. Unfortunately, Ms. Johnson abandoned her doctoral program and failed to preserve the various collections made during this sojourn. She also left me, her major professor, with a large set of *Bocconia* specimens to annotate and return to various institutions, none of these representing the species described herein. Thus my delight to find among Hinton's numerous collections from Cerro Quiexobra, newly assembled specimens that might serve as type material for this long-remembered but unnamed taxon.

Bocconia hintoniorum will key to *B. integrifolia* Kunth in Standley's (1922) *Trees and Shrubs of Mexico*. The latter, however, is typified by Peruvian material and, as noted by Hutchinson (1920) in his account of the genus, is restricted to South America. Although the material of *B. hintoniorum* will key to *B. integrifolia* in the treatment of Hutchinson, it is seemingly more closely related to the Central American *B. gracilis* Hutch., with which it is compared here.

It is a pleasure to name this attractive new species for the Hinton family, whose collections in México are becoming increasingly legendary.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Ted Delevoryas for reviewing the manuscript.

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Phytologia (November 1995) 79(5):317-318.

A NEW SPECIES OF *DESMANTHODIUM* (ASTERACEAE, HELIANTHEAE) FROM OAXACA, MEXICO

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ABSTRACT

A new species, ***Desmanthodium hintoniorum*** B.L. Turner, is described from the state of Oaxaca, México (Mpio. Miahuatlán). It is closely related to the Guatemalan species, *D. guatemalense* Hemsl., but differs in having narrower, nearly entire elliptical leaves and being glabrous throughout, including all floral parts.

KEY WORDS: Asteraceae, Heliantheae, *Desmanthodium*, México, Oaxaca, systematics

Routine identification of Mexican Asteraceae has revealed the following novelty.

DESMANTHODIUM HINTONIORUM B.L. Turner, *spec. nov.* TYPE: MEXICO. Oaxaca: Mpio. Miahuatlán, La Sirena, 2525 m, 23 Oct 1995, *Hinton et al. 26409* (HOLOTYPE: TEX!).

Similis *D. guatamalensi* Hemsl. sed foliis ellipticis et integris vel paene integris (vice foliorum ovatorum et dentatorum), caulibus, foliis, partibusque floralibue ubique glabris (vice diverse pubescentium).

Shrub to 1.5 m high, the stems clearly woody and glabrous throughout. Leaves mostly 10-12 cm long, 3.0-3.5 cm wide; petioles 2-4 mm long; blades narrowly elliptical, pinnately nervate, gradually tapering to the petioles, the margins with minute well-spaced, denticulate teeth, but seemingly entire upon superficial inspection. Heads much congested and terminal on stout peduncles 0.5-2.0 cm long, the syncephalous structure ca. 1.5 cm high and 2-3 cm across. Bracts ovate, glabrous, subcoriaceous, 8-10 mm long, 5-6 mm wide, not forming a well-defined involucral-bound head. Receptacle plane, glabrous. Pistillate florets 2, fertile; ligule absent, the tube ca. 1.5 mm long; achenes ellipsoid, glabrous, completely enclosed in fused, elliptical (in outline) bracts, the latter 6-7 mm long, ca. 2.5 mm wide, glabrous throughout. Disk florets ca. 8, sterile, the style branches fused, forming a conical brush ca. 2 mm long;

corollas white, glabrous, 5-lobed, the lobes ca. 1.4 mm long with ill-defined veins, these scarcely marginal, if at all; base of style surrounded by a well defined nectary ca. 0.75 mm high; achenes (although sterile), elongating at anthesis up to several times their bud-size, so as to resemble stout stalks 5-10 mm long.

This taxon is clearly closely related to the more southern, *Desmanthodium guatemalense* Hemsl. but differs in having narrower, elliptical, nearly entire leaves, and being glabrous throughout, including all floral parts. So far as known, *D. guatemalense* does not occur in Chiapas or elsewhere in México, being confined to Guatemala and Honduras.

It is a pleasure to name this for the Hinton family, several generations having now added, and continue to add, numerous remarkable Mexican collections to the research institutions of North America.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Piero Delprete for reviewing the paper.

Phytologia (November 1995) 79(5):319-324.

ADDITIONS TO THE FLORAS OF COLORADO AND NEW MEXICO

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ABSTRACT

Zigadenus virescens (Kunth) Macbr. is added to the west-slope flora of Colorado. Thirteen new records are added to the New Mexico flora including *Artemisia pygmaea* A. Gray, *Berteroa incana* (L.) DC., *Cleomella palmerana* M.E. Jones, *Eleocharis bella* (Piper) Svenson, *Epilobium lactiflorum* Hausskn., *Hackelia ursina* (Greene *ex* A. Gray) I.M. Johnston var. *pustulosa* (Macbr.) J.L. Gentry, *Hypoxis hirsuta* (L.) Cov., *Huperzia lucidula* (Michx.) Trev., *Lycopodium clavatum* L., *Malacothrix glabrata* (D.C. Eat.) A. Gray, *Senecio amplectens* A. Gray var. *holmii* (Greene) Harrington, *Senecio integerrimus* Nutt., and *Solidago speciosa* Nutt. var. *pallida* Porter. All but one are native North American taxa.

KEY WORDS: Flora, Colorado, New Mexico

Botanical field surveys and curatorial work at the University of New Mexico Herbarium (UNM) by the authors have resulted in one new record for the Colorado flora and thirteen additional records of New Mexico vascular plants. All but one are native North American taxa and seven represent significant disjunctions in their previously known geographic ranges. This report is prepared as a contribution to the *Working Index of New Mexico Vascular Plant Names* (Roalson & Allred 1995) and to

assist the Flora of North America Project. Nomenclature conforms to those two floristic endeavors.

COLORADO

LILIACEAE

Zigadenus virescens (Kunth) J.F. Macbr. - Eagle Co., Tennessee Pass, 3100-3500 msm, 4-6 Sept 1915, *Eggleston 11801* (COLO). Gunnison Co., Rustler's Gulch above Gothic, 3200 m., 28 Aug 1938, *Ewan 11796* (COLO); West Elk Mountains, summit of McClure Pass, 1.3 km from main Hwy along dirt road following the ridge eastward, in wet depressions in aspen forest, elev: 2670 msm, 10 July 1994, *W.A. Weber & R.C. Wittmann 19070* (COLO,UNM). Pitkin Co., W of Redstone, 3050 m, 22 Aug 1980, *Fenton s.n.* (COLO); White River National Forest, Maroon Bells Snowmass Wilderness, Hell Roaring Creek, T9S R87W Section 31, Subalpine meadow, ca. 3350 m, 20 Aug 1995, *T. Hogan 2968* (COLO,UNM). Routt Co., Grand Lake, 4 July 1937, *K.R. Johnson 571* (COLO); Diamond Park Road, 2 km N of Seedhouse G.S., 45 km N of Steamboat Springs, 18 July 1951, *Weber 6789* (COLO).

Comment: The first Colorado records of a predominantly Madrean species that was previously known from México, southeastern Arizona, and southwestern New Mexico (Hess & Sivinski 1995). These collections represent an approximately 400 km northern disjunction from the nearest known population in the Datil Mountains of northern Catron County, New Mexico. This species is occasionally sympatric and frequently confused with *Zigadenus elegans* Pursh (= *Anticlea elegans* [Pursh] Rydb. of some Colorado authors). *Zigadenus virescens* is distinguished by its campanulate corolla, cernuous flowers at anthesis, and stamens longer than the tepals as compared to the rotate-campanulate corolla, erect flowering pedicels, and usually longer tepals of *Z. elegans*.

NEW MEXICO

ASTERACEAE

Artemisia pygmaea A. Gray - McKinley Co., Fort Wingate, NE side of military reservation ca. 1 km NW of Wingate High School, elev: 2100 m, locally common on sodic, red clay of the Chinle Shale Formation with *Sporobolus airoides, Eriogonum microthecum,* and *Atriplex obovata*, 31 May 1994, *R. Sivinski & K. Lightfoot 2710* (UNM); same location, 26 Oct 1994, *W. Hevron 2261* (UNM); 1 km N of frontage road between I-40 and Iyanbito, T15N R16W Section 14, on red clayey sand of Chinle Fma with *Chrysothamnus viscidiflorus, Bouteloua gracilis,* and scattered *Juniperus monosperma*, 26 Oct 1994, *W. Hevron 2262* (UNM).

Comment: First records for New Mexico and a nearly 200 km southern disjunction from the populations vouchered in southwestern Colorado (*Anderson 89-21 & 90-34* [COLO]). Welsh *et al.* (1993) observed this sagebrush on unique substrates that provide habitat for other rare plant species. The Fort Wingate, New Mexico, population is consistent by occurring with the relatively rare *Phacelia cephalotes* A. Gray and the narrow endemic *Erigeron sivinskii* Nesom.

Malacothrix glabrata (D.C. Eat. *ex* A. Gray) A. Gray - Hidalgo Co., Peloncillo Mountains, ca. 56 km SSW of Animas, T33S R21W Section 16 SW1/4, elev: 1640 m, rare on flat, rocky (volcanic) hilltop with *Bouteloua hirsuta, Agave palmeri*, and *Malacothrix fendleri*, 26 Apr 1993, *W. Dunmire 1223* (UNM). Luna Co., on NE footslope of Taylor Mountain ca. 10 km ENE of Faywood Hotspring, T20S R10W Section 17 NE1/4, elev: 1600 m, locally rare on rhyolitic soils in desert grassland with *Pleuraphis mutica, Bouteloua curtipendula, Malacothrix fendleri, Ephedra,* and *Fallugia*, 12 Apr 1995, *R. Sivinski 2949* (UNM).

Comment: First records for New Mexico and an eastern range extension from Graham County, Arizona (Kearney & Peebles 1951).

Senecio amplectens A. Gray var. *holmii* (Greene) Harrington - Taos Co., Sangre de Cristo Mountains, west slope of Wheeler Peak, elev: 3650 m, scree slopes at treeline, 20 Jul 1986, *C.F. Keller 328.2C* (UNM).

Comment: First record for New Mexico. A high elevation, short-stature variety (with basal leaves dominant) previously thought to be a Colorado endemic (Weber 1990). Variety *amplectens* also occurs in northern New Mexico, but at different localities and usually in subalpine habitats.

Senecio integerrimus Nutt. var. *integerrimus* - Rio Arriba Co., Hwy 84 N of Chama and 1.6 km S of NM/CO border, moist meadow in open piñon-juniper habitat with *Delphinium nelsonii* and *Phlox caryophylla*, 21 May 1991, *C.F. Keller 656.3* (UNM).

Comment: First record for New Mexico and a minor southern range extension for this widespread, western North American species.

Solidago speciosa Nutt. var. *pallida* Porter - Los Alamos Co., Jemez Mountains, Los Alamos, S rim of Pajarito Canyon, 0.5 km E of State Route 4, elev: 2360 m, on dry ridge with *Pinus ponderosa*, 8 Oct 1990, *C.F. Keller 653* (UNM). San Miguel Co., Sangre de Cristo Mountains, Gallinas Canyon west of Las Vegas, T17N R14E Section 14, elev: 2300 m, roadside slopes and ditches, 29 Aug 1994, *C.F. Keller 938C* (UNM).

Comment: First records for New Mexico. The San Miguel County collection is a minor southern range extension from the east slope of the Colorado Rockies (Weber 1990). The Jemez Mountain record represents a 100 km western range extension for the species.

BORAGINACEAE

Hackelia ursina (Greene *ex* Gray) I.M. Johnston var. *pustulosa* (Macbr.) J.L. Gentry - Hidalgo Co., Animas Mountains, lower Indian Creek Canyon, elev: 1850 m, 13 Sept 1975, *W. Wagner 1507* (UNM); Animas Mountains, unnamed canyon above Eckels Tank, T32S R19W Section 8 SW1/4, elev: 1860 m, locally rare on N-facing slope of rhyolitic soil in upper encinal of *Quercus arizonica, Q. hypoleucoides, Rhus trilobata*, and *Yucca schottii,* 21 Aug 1993, *R. Sivinski & L. McIntosh 2531* (UNM).

Comment: First records of this variety in New Mexico. Variety *pustulosa* was previously known from western Chihuahua and southeastern Arizona (Gentry 1974). Variety *ursina* is common in the Black Range and Mogollon Mountains of southwestern New Mexico. Their ranges overlap at the Animas Mountains in the New Mexico boot heel and the Chiricahua Mountains in adjacent Arizona.

BRASSICACEAE

Berteroa incana (L.) DC. - Sandoval Co., Jemez Mountains, La Cueva, intersection of State Route 4 and 126, elev: 2320 m, waste ground at roadside, 5 Aug 1995, *C.F. Keller 976C* (UNM).

Comment: First New Mexico record of this Eurasian weed. An adventive species that is established in North America from Nova Scotia to Washington (Great Plains Flora Assoc. 1986) and is spreading to southern montane areas in Colorado (Weber 1990) and New Mexico.

CAPPARACEAE

Cleomella palmerana M.E. Jones - San Juan Co., west of Rattlesnake, 26 Apr 1947, *O. Clark 14107* (UNM). Identified and annotated by Hugh Iltis (WIS), 1983.

Comment: First record for New Mexico and a minor southern range extension from southwestern Colorado (Iltis, letter to Lowrey).

CYPERACEAE

Eleocharis bella (Piper) Svenson - Rio Arriba Co., Tusas Mountains, Posos Lake, T27N R8E Section 15, elev: 2630 m, abundant on shallow lake bed within conifer forest, on drying mud with *Plagiobothrys scouleri* and *Veronica*, 6 Aug 1991, *R. Sivinski 1771* (NMC,UNM); Tusas Ridge west of Petaca, T26N R9E Section 6 NW1/4, on mud of small impoundment created by logging disturbance in ponderosa pine forest, 30 July 1992, *R. Sivinski 1928* (UNM). Sierra Co., Black Range, pond

at head of Sawmill Canyon, T10S R10W Section 20 NW1/4, elev: 2350 m, 16 Aug 1982, *R. Fletcher & C. Barnard 6688* (UNM).

Comment: Although Cronquist *et al.* (1977) acknowledged this species as occurring in New Mexico, Martin & Hutchins (1980) included it in their *Flora of New Mexico* as expected in the southwestern part of the state, but with no certain records. These collections document the species for southwestern New Mexico and also the north-central part of the state.

LILIACEAE

Hypoxis hirsuta (L.) Cov. - Cibola Co., Zuni Mountains, Agua Fria, 26 km W of Grants, T10N R12W Section 34, ponderosa pine forest, elev: 2440 m, 22 Aug 1963, *K.K. Goodrow 756* (UNM). Identified and annotated by Doug Henderson (ID) and Anita Cholewa (MIN), 1990.

Comment: Martin & Hutchins (1980) included this species in their *Flora of New Mexico* as expected in the northeastern corner of the state. This collection documents the species for New Mexico, but in the northwestern part of the state. The nearest previous collections are from southeastern Colorado (Weber 1990).

LYCOPODIACEAE

Huperzia lucidula (Michx.) Trev. - Santa Fe Co., 4 km N, 4.4 km E from Santa Fe Plaza on ski run road, 9 Aug 1961, *C.K. Dixon A-289* (UNM). Identified and annotated by Michael Windham (UT), 1990.

Comment: First record of the genus and species for New Mexico. The range of this species is illustrated in the *Flora of North America* as east of the Mississippi River Valley (Flora of North America Editorial Committee 1993). This New Mexico collection represents a significant disjunction to the southern Rocky Mountains.

Lycopodium clavatum L. - Sandoval Co., Sandia Mountains, N of Sandia Crest on trail through moist Canadian forest, elev: 3050 m, 23 Apr 1965, *C.B. Jones 12-2* (UNM). Identified and annotated by Michael Windham (UT), 1990.

Comment: First record of this species for New Mexico. The North American distribution of this cosmopolitan species is the northeastern United States, southern Canada, and the Pacific northwest (Flora of North America Editorial Committee 1993). It also occurs in the mountains of México. This New Mexico collection represents a significant disjunction to interior southwestern North America.

ONAGRACEAE

Epilobium lactiflorum Hausskn. - Taos Co., woods on west exposure along trail to Wheeler Peak, 36°33′ 20″ N 105°25′ 45″ W, elev: 3370-3400 m, 8 July 1967, *H. Mackay 5T-214* (UNM). Identified and annotated by Peter Hoch (MO), 1977.

Comment: First record for New Mexico and a southern range extension from the subalpine flora of Colorado (Weber 1990).

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We are grateful to Kelly Allred (NMCR), Rich Spellenberg (NMC), and Bill Weber (COLO) for reviewing the manuscript and providing helpful comments. Bill Weber brought the *Zigadenus virescens* collections to our attention and loaned specimens for review. We also thank Bill Dunmire and Bill Hevron for allowing us to publish their collection records.

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Phytologia (November 1995) 79(5):325-339.

MUHLENBERGIA MONTANA AND *M. QUADRIDENTATA*, A CASE OF A NATURAL HYBRID SWARM

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Becaria de la COFAA

ABSTRACT

This study examined variation in morphology for 49 populations of *Muhlenbergia montana* (Nutt.) Hitchc. and *M. quadridentata* (H.B.K.) Kunth representing the sympatric range of the species. These and previous results suggest the formation of hybrid swarms between the two species. Suspected hybridization is confirmed by the morphometric analysis of the species growing in this area. Flavonoid profiles, anatomical, and cytological features seem to support this theory.

KEY WORDS: *Muhlenbergia montana*, *Muhlenbergia quadridentata*, hybrid swarm, Poaceae

RESUMEN

El presente estudio examinó la variación morfológica de 49 poblaciones de *Muhlenbergia montana* (Nutt.) Hitchc. y *M. quadridentata* (H.B.K.) Kunth, representando el área de distribución simpátrica de las especies. Estos y previos resultados sugieren la formación de camadas de híbridos entre las dos especies. La hibridación sospechada se confirma a través del análisis morfométrico de las especies que ocurren en esta área. El perfil de flavonoides y los caracteres anatómicos y citológicos parecen apoyar esta teoría.

PALABRAS CLAVES: *Muhlenbergia montana*, *Muhlenbergia quadridentata*, camadas de híbridos, Poaceae

Muhlenbergia montana (Nutt.) Hitchc., a widely distributed species (from Montana to México and Guatemala) is perhaps, a very successful species that along its wide distribution seems to hybridize with putative species; Welsh *et al.* (1987)

reported numerous intermediates formed with *M. filiculmis* Vasey in the Rocky Mountains, while, Herrera-Arrieta & Grant (1993) mention the suspected hybridization with *M. quadridentata* (H.B.K.) Kunth, in the western and central part of México.

Initial macromorphological studies of the *Muhlenbergia montana* complex (Herrera-A. & Bain 1991 and Herrera-Arrieta & Grant 1993, 1994) have shown that some specimens of *M. quadridentata* shared certain features of *M. montana*. Further macromorphological observations of floral and vegetative characters analyzed with multivariate statistical tests and phenetic analyses, augmented by information on pollen fertility and their geographical range of distribution, provide a context for evaluating the taxonomic limits and relationships of these two species.

Phenetic analyses of morphological, anatomical, and flavonoid content data suggested that *Muhlenbergia montana* and *M. quadridentata* hybridize in sympatric areas.

The present analysis attempted to estimate the morphological variation among populations within these two species belonging to the sympatric area of distribution in México, to confirm that hybridization occurs.

MATERIALS AND METHODS

A study of 49 freshly collected specimens (Table 1) was assembled. The collection locations seemed to cover the sympatric area of distribution of these two species at a range of 2100-3650 m, 17-24° N and 90-105° W. A few other herbarium specimens were selected to represent the morphological variation.

Populations of *Muhlenbergia* vary in size from a few scattered individuals to hundreds of plants covering a large area. Sample sizes were randomly selected of ten to fifteen individuals per population at each location, to maximize the probability of sampling genetically different individuals. Eighteen morphological characters were scored and are shown in Table 2. Many loaned herbarium specimens were reviewed from: CIIDIR, CHAPA, ENCB, HUAA, IEB, and MEXU (acronyms follow Holmgren *et al.* 1990).

The individuals of each population were measured for eighteen continuous macromorphological variables (Table 2), where each OTU is represented by the mean value (measurement) per variable. Application of Cluster Analysis and Principal Component Analysis (PCA) for a phenetic study were the most representative and are elaborated below.

A distribution map (Figure 1) is included, based on over 950 herbarium specimens identified as *Muhlenbergia montana* and *M. quadridentata*. After examination, 49 locations were selected to collect fresh material representing the geographic ranges and putative hybrids. The specimens were measured and recorded.

Table 1. Specimens of *Muhlenbergia* analyzed in this study.

M. montana (Nutt.) Hitchc. MEX. AGS: *De La Cerda 3989* (CIIDIR,HUAA). CHIH: *Herrera, Peterson, & Annable 950, 956, 964, 968, 970, 972, 974, 980* (CIIDIR,MTMG,US); *Peña 802* (CIIDIR). DF: *Herrera & Cortés 922, 924* (CIIDIR, MTMG,US). DGO: *Herrera & Acevedo 984* (CIIDIR,MTMG,US); *Acevedo 582* (CIIDIR); *Acevedo & González 529, 534, 535, 536, 537, 540* (CIIDIR); *Herrera & González 1022* (CIIDIR). MOR: *Herrera & Cortés 926, 928* (CIIDIR,MTMG,US). OAX: *Herrera 900* (CIIDIR,MTMG); *Carrillo 361* (MEXU,ENCB).

M. quadridentata (H.B.K.) Kunth MEX. COL: *Herrera & Cortés 935, 936* (CIIDIR,MTMG,US). DF: *Herrera & Cortés 911* (CIIDIR,MTMG,US). DGO: *Acevedo & González 527* (CIIDIR,MTMG). HGO: *Chavez 134* (CIIDIR,ENCB); *Mancera 1* (CIIDIR,CHAPA). JAL: *Herrera & Cortés 933* (CIIDIR,MTMG,US). MEX: *Herrera & Cortés 904, 906, 907, 908, 913, 914, 915, 929* (CIIDIR,MTMG,US); *Herrera 241* (CIIDIR,ENCB); *Vega 276* (CIIDIR, CHAPA,ENCB); *Hernández 15/78* (CIIDIR,ENCB). MOR: *Herrera & Cortés 925, 927* (CIIDIR,MTMG,US). PUE: *Herrera & Cortés 916, 917, 918, 919* (CIIDIR,MTMG,US). OAX: *Herrera 899* (CIIDIR,MTMG).

Table 2. Coding of macromorphological variables used in the phenetic analysis.

1. Leaves length, num (for numerical).
2. Old sheaths, 1) present, 2) absent.
3. Lamina leaves, 1) involute, 2) flat, 3) flat-involute.
4. Leaf width, num.
5. Ligule length, num.
6. Ligule shape, 1) truncate, 2) apiculate.
7. Spikelets length, num.
8. First glume length, num.
9. Second glume length, num.
10. First glume width, num.
11. Second glume width, num.
12. Second glume teeth length, num.
13. Lemma length, num.
14. Lemma pubscence, 1) in base and margins, 2) in the whole surface.
15. Lemma awn length, num.
16. Palea length, num.
17. Palea pubescence, 1) scarce, 2) moderate.
18. Anthers length, num.

Flavonoid profiles were taken from (Herrera-A. & Bain 1991). A data matrix of morphological characters (Tables 3 & 4) was submitted to a Principal Component Analysis (Figures 2-4) and a cluster analysis using the unweighted pair-group mathematical average clustering analysis (UPGMA) of the Canberra distance matrix through the use of the Multivariate Statistical Package Version 1.31, Kovach (1987) to generate the dendrogram (Figure 5).

Differential staining (Alexander 1969) of aborted and nonaborted spores was used to assess sterility in the suspected hybrid populations, results are presented in Table 5.

RESULTS AND DISCUSSION

Muhlenbergia quadridentata is often confused with *M. montana* (McVaugh 1983; Herrera-A. & Bain 1991; Herrera-Arrieta & Grant 1992). Field observations of the Mexican populations of these two species suggest that, although the two taxa can often be easily recognized in the field, variation between the distinguishing characters and the presence of intermediate forms have caused confusion in this group.

Muhlenbergia montana is more widely distributed, at elevations from 2000 to 3100 m, from 15° to 45° N and 90° to 112° W. *Muhlenbergia quadridentata* grows mostly at higher altitudes (more than 3000 m), and from 17° to 21° N, 96° to 102° W. Scattered populations were found close to 2000 m, at higher latitudes 24° N and 105° W. The former has spikelets and anthers shorter than *M. quadridentata*, with glumes subequal, and the second glume 3-toothed and conspicuously but shortly 3-awned.

These two species seem to form a group on the basis of their flavonoid content (Herrera-A. & Bain 1991). The flavonoid profiles show that *Muhlenbergia montana* lacks four compounds present in *M. quadridentata*; while *M. quadridentata* lacks a compound always present in *M. montana*. These unique compounds are considered diagnostic marks (mark-q and mark-m for the compounds present in one species and absent in the other) in this work. From the twenty populations of *M. montana* studied for flavonoids (Herrera-A. & Bain 1991), fourteen shared having the well defined compounds identified for this species. On the other side, from the seventeen populations studied of *M. quadridentata*, fourteen shared having the seventeen flavonoids characteristic for *M. quadridentata*. The remaining populations (six populations of the former and three populations of the later) have shown a variable mixture of the marked flavonoids. The presence or absence of these compounds revealed key characters to delineate the identity of morphological intermediates between *M. montana* and *M. quadridentata*.

Principal Component Analysis (PCA), using averages of eighteen measured characters (Table 2), was used to produce a graphic representation of the variation among the groups (Figures 2 to 4). Relative positions of individuals on the PC axes represent their relative similarity for the characters used. In this analysis the two species are completely separated by the first two principal components.

Table 3. Data matrix for the characters of *Muhlenbergia quadridentata* (H.B.K.) Kunth used in this study.

OTU	Coll. #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	H&C 899	30	2	3	2.0	2.0	1	4.0	2.8	4.0	0.7	1.0	1.5	3.5	1	1.0	3.0	1	1.8
2	H&C 900	20	2	1	1.5	2.0	1	4.0	2.0	3.0	0.7	1.2	0.6	3.5	1	1.0	3.0	1	1.8
3	H&C 933	18	2	1	1.0	2.0	1	4.0	1.8	3.5	0.7	1.0	0.0	3.5	1	1.0	3.0	1	1.6
4	VEGA 276	22	2	1	1.0	3.0	2	4.0	2.0	3.6	0.6	1.0	0.4	3.4	1	0.9	3.0	1	2.0
5	H&C 914	28	2	1	1.0	2.0	1	4.2	1.8	3.2	0.5	1.0	0.8	4.2	1	1.1	3.5	1	2.2
6	H&C 906	33	2	3	2.0	2.0	2	4.5	2.0	4.0	0.6	1.0	1.0	4.0	1	1.4	3.5	1	2.1
7	H&C 917	23	2	1	0.8	2.0	1	3.8	1.6	3.2	0.7	0.8	0.0	3.6	1	0.8	3.0	1	1.6
8	H&C 916	30	2	1	1.0	2.0	1	4.0	1.7	3.0	0.5	1.0	0.2	3.8	1	0.8	3.0	1	2.2
9	H&C 918	30	2	1	1.0	2.0	1	4.8	2.8	4.8	0.4	1.2	0.1	4.2	1	1.2	4.0	1	2.2
10	H&C 913	22	2	1	1.0	1.5	1	3.5	2.0	3.0	0.7	1.4	0.1	3.2	1	0.8	3.0	2	2.1
11	H&C 919	30	2	1	1.0	2.0	1	3.8	1.4	2.8	0.7	1.4	0.5	3.8	1	0.7	3.5	2	1.8
12	H&C 915	21	2	3	2.0	2.0	1	5.0	2.0	4.0	0.8	1.4	0.5	4.5	1	0.8	3.5	1	2.2
13	H&C 927	18	2	3	2.0	4.0	2	3.8	1.2	2.8	0.5	1.0	0.3	3.2	1	1.2	3.0	2	2.2
14	H&C 911	28	2	3	2.0	4.0	2	3.5	1.5	2.5	0.4	0.8	0.2	3.0	1	1.0	2.5	1	1.8
15	H&C 907	13	2	1	1.5	2.0	1	3.8	2.0	3.0	0.5	1.2	0.1	3.5	1	1.0	3.0	1	2.0
16	H&C 904	15	2	1	1.0	2.0	1	3.8	2.0	3.0	0.6	1.0	0.1	3.5	1	0.9	3.0	2	1.8
17	H&C 936	16	2	1	1.0	4.0	2	4.0	1.5	2.8	0.8	1.2	0.1		1	0.8	3.8	1	2.0
18	H&C 935	12	2	1	1.0	3.0	2	4.2	2.2	3.8	0.7	1.0	0.0	4.0	1	1.2	3.8	2	2.0
19	H&C 929	21	2	1	1.0	2.0	1	3.2	1.6	2.8	0.7	1.1	0.1	3.0	1	0.8	2.8	1	1.6
20	H&C 908	20	2	1	1.0	2.0	1	4.0	2.2	3.5	0.5	1.0	0.5	3.5	1	0.9	3.2	1	1.5
21	H&C 925	15	2	1	1.0	10	2	5.0	2.5	4.0	0.4	0.8	0.2	4.5	1	1.2	4.0	2	2.2
22	CHAVE Z 134	11	2	1	1.0	8.0	2	4.0	1.8	3.0		1.4	0.1	3.8	1	0.8	3.2	1	2.0
23	HDEZ 15 78	20	2	1	2.0	2.5	1	4.2	2.2	3.8	0.7	1.2	0.3	4.0	1	0.4	3.8	1	1.8
24	MANCE RA 1	19	2	2	2.0	2.0	1	3.2	2.0	3.0	0.7	1.2	0.3	3.0	1	1.2	2.8	2	1.8
25	H 241	11	2	1	1.0	2.0	1	3.2	1.8	2.8	0.6	0.8	0.5	3.0	[illegible]	1.2	2.8	2	2.0

COLLECTORS= H&C: Herrera & Cortés, HDEZ: Hernández, H: Herrera.

Table 4. Data matrix for the characters used in this study of *Muhlenbergia montana* (Nutt.) Hitchc.

OTU	Coll. #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
26	ACEV 582	22	2	2	1.7	2.2	1	4.5	4.0	5.0	0.7	1.0	2.5	4.2	2	1.2	4.0	2	2.0
27	H&G 1022	27	2	1	1.2	2.5	2	3.8	2.5	3.0	0.6	0.9	1.5	3.5	2	1.7	3.0	2	2.0
28	DLC 3839	27	2	3	1.5	7.0	2	3.8	3.0	3.0	0.6	1.1	1.5	3.0	2	1.2	2.8	2	2.0
29	A&G 534	32	1	2	4.0	5.0	2	4.0	3.2	4.0	0.7	1.2	2.0	4.0	2	1.5	3.8	2	2.0
30	A&G 529	27	1	3	1.5	4.0	2	4.0	3.0	3.8	0.7	1.2	1.5	3.8	2	1.2	3.5	2	1.8
31	A&G 535	26	1	2	2.2	2.5	2	4.0	3.0	3.0	0.6	1.0	1.2	3.8	2	1.5	3.5	2	2.2
32	CARR 361	20	2	1	1.0	6.0	2	3.8	3.0	3.2	0.5	0.8	1.8	3.2	2	1.5	3.0	2	1.6
33	A&G 540	21	1	2	1.5	3.0	2	3.5	2.0	3.0	0.6	1.2	1.0	3.2	2	1.2	3.0	2	2.2
34	PENA 802	22	1	2	2.5	1.5	1	4.0	3.0	4.0	0.7	1.2	2.0	4.0	2	1.0	3.8	2	0.0
35	H&C 924	25	2	3	1.2	3.0	2	4.0	2.0	3.0	0.5	0.9	0.5	3.8	1	1.2	3.5	1	0.0
36	H,P&A 950	21	2	3	1.5	10	2	4.0	3.5	3.5	0.4	0.9	1.5	4.0	2	1.0	3.8	2	2.0
37	H&C 928	14	2	1	0.5	2.0	1	3.5	1.8	2.0	0.5	0.9	0.3	3.2	1	1.2	3.0	1	0.0
38	H,P&A 968	16	1	1	1.0	5.0	2	3.2	2.0	2.8	0.5	0.8	1.5	3.0	2	1.5	2.8	2	1.8
39	H&C 922	10	2	1	0.5	6.0	1	3.8	2.0	3.0	0.7	1.2	1.0	3.5	1	1.2	3.2	1	2.0
40	H,P&A 972	22	2	1	1.2	8.0	2	4.0	2.8	3.3	0.6	1.2	1.6	4.0	2	1.1	3.8	2	1.8
41	H&C 926	18	2	1	1.0	2.0	1	3.0	1.5	2.2	0.6	1.0	0.3	3.0	1	0.8	2.8	1	2.0
42	H,P&A 970	21	2	3	1.2	15	2	4.0	3.0	3.5	0.6	1.0	1.5	3.5	2	0.8	3.2	1	2.0
43	H,P&A 974	24	1	3	1.5	10	2	4.0	3.0	3.5	0.7	1.0	1.5	3.8	2	1.5	3.5	?	1.8
44	H,P&A 980	09	1	3	2.0	7.0	2	4.2	3.5	3.8	0.6	1.2	2.0	4.0	2	1.1	3.8	2	2.0
45	H,P&A 956	21	2	3	2.0	11	2	4.0	3.0	3.5	0.6	0.9	1.5	3.8	2	1.5	3.5	2	1.8
46	H,P&A 964	11	2	1	1.0	10	2	3.5	2.2	2.5	0.6	1.1	1.2	3.2	2	0.8	3.0	2	1.8
47	H&A 984	11	1	1	0.8	3.0	1	3.8	2.0	2.5	0.6	1.0	0.5	3.5	2	0.8	3.3	2	1.5
48	A&G 536	28	1	3	2.0	3.0	2	3.8	2.5	3.2	0.8	1.1	1.5	3.5	2	1.2	3.2	2	2.2
49	A&G 537	22	1	2	2.5	2.5	2	4.0	2.5	3.5	0.8	1.2	0.8	3.8	2	1.5	3.5	2	1.5

COLLECTORS= ACEV.: Acevedo; H&C: Herrera & Cortés; H&G: Herrera & González; A&G: Acevedo & González; CARR.: Carrillo; DLC: De La Cerda; H,P&A: Herrera, Peterson & Annable.

Figure 1. Map of *Muhlenbergia montana* and *M. quadridentata* distribution.

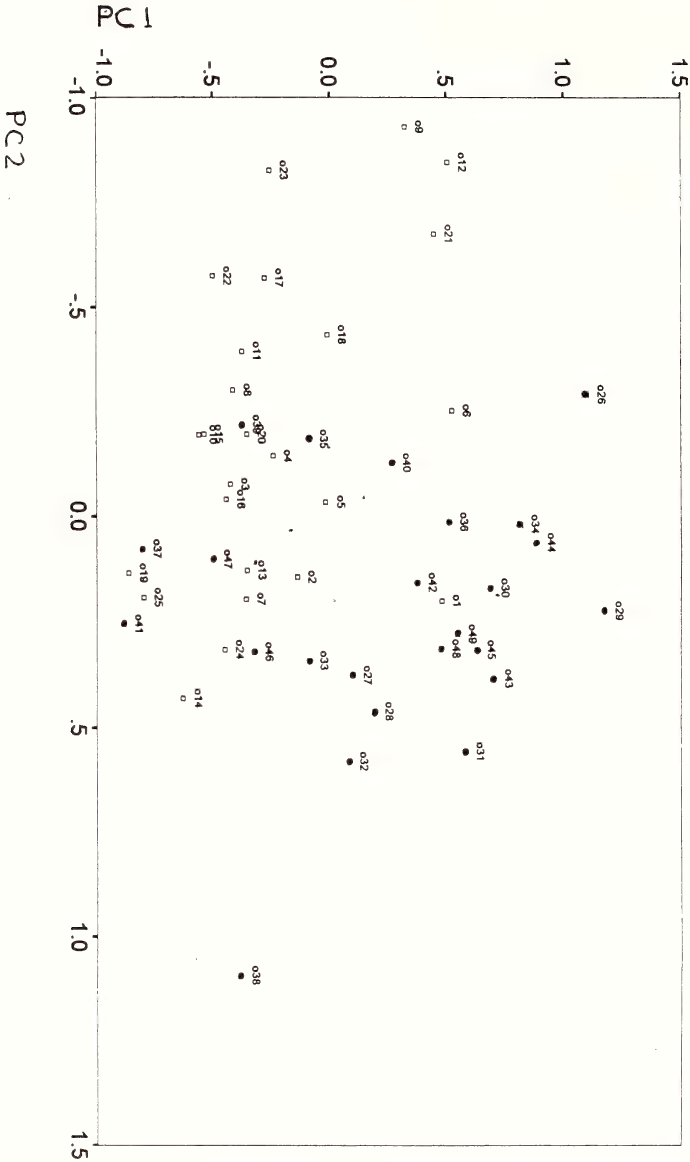

Figure 2. Scatter diagram of individuals from pure and mixed populations of *Muhlenbergia montana* and *M. quadridentata* on Principal Components 1 and 2. Grouping is based on morphological characters.

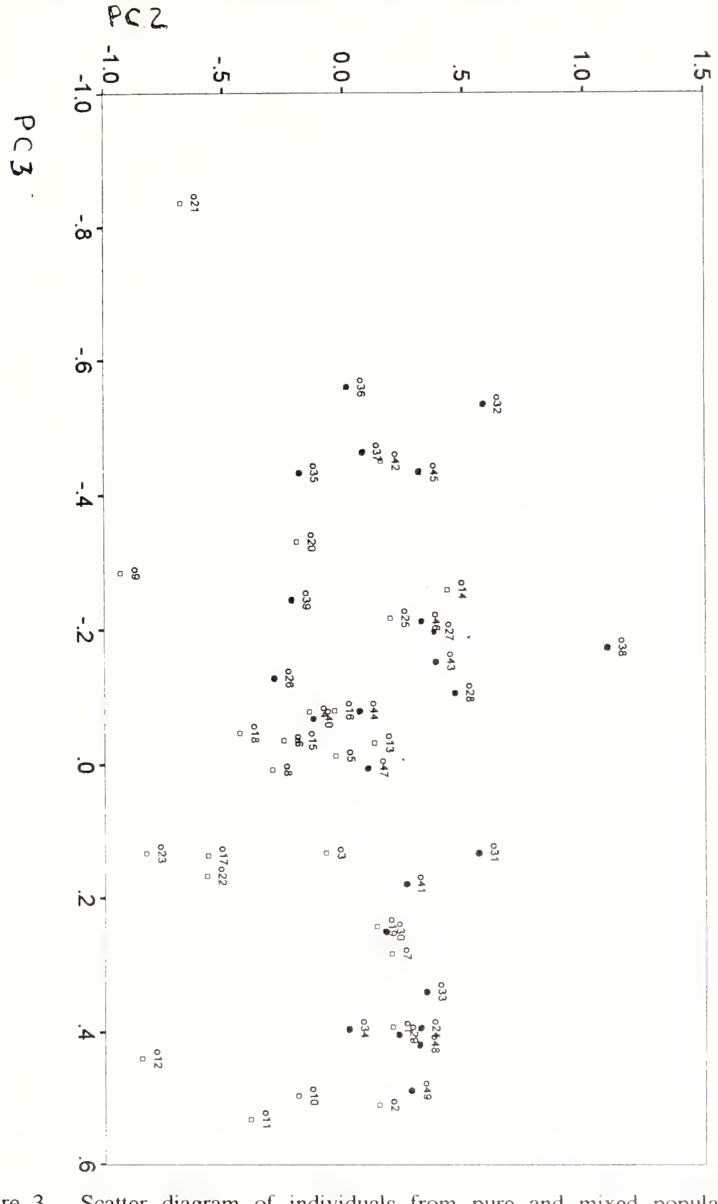

Figure 3. Scatter diagram of individuals from pure and mixed populations of *Muhlenbergia montana* and *M. quadridentata* on Principal Components 2 and 3. Grouping is based on morphological characters.

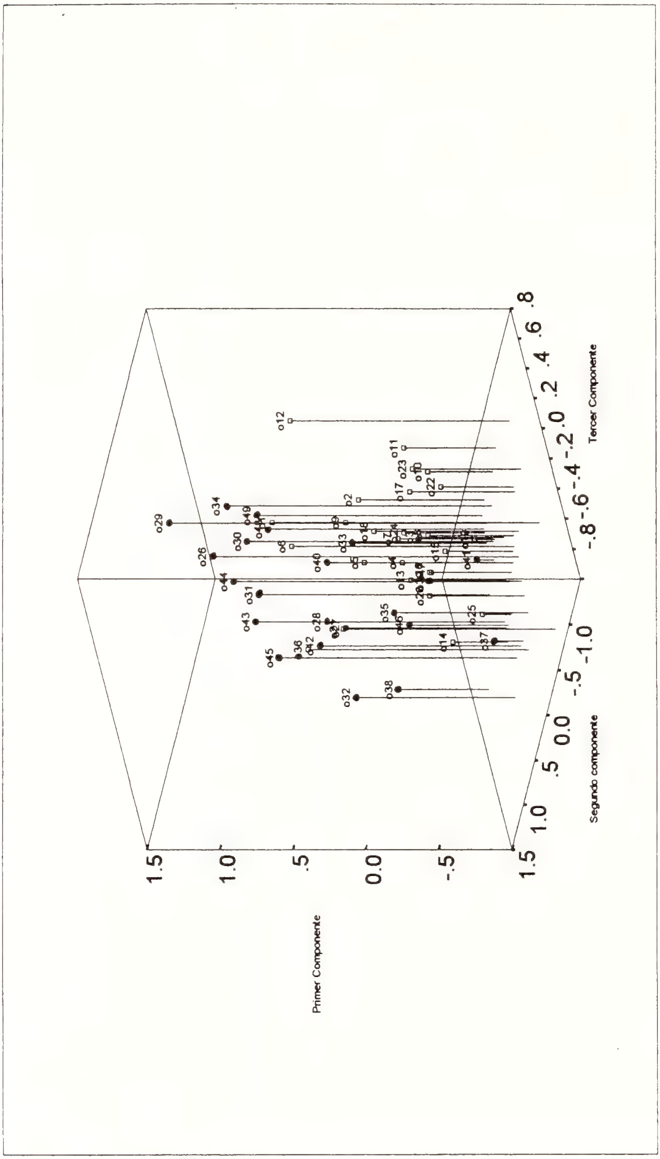

Figure 4. Scatter diagram of individuals from pure and mixed populations of *Muhlenbergia montana* and *M. quadridentata* on Principal Components 1, 2, and 3. Grouping is based on morphological characters.

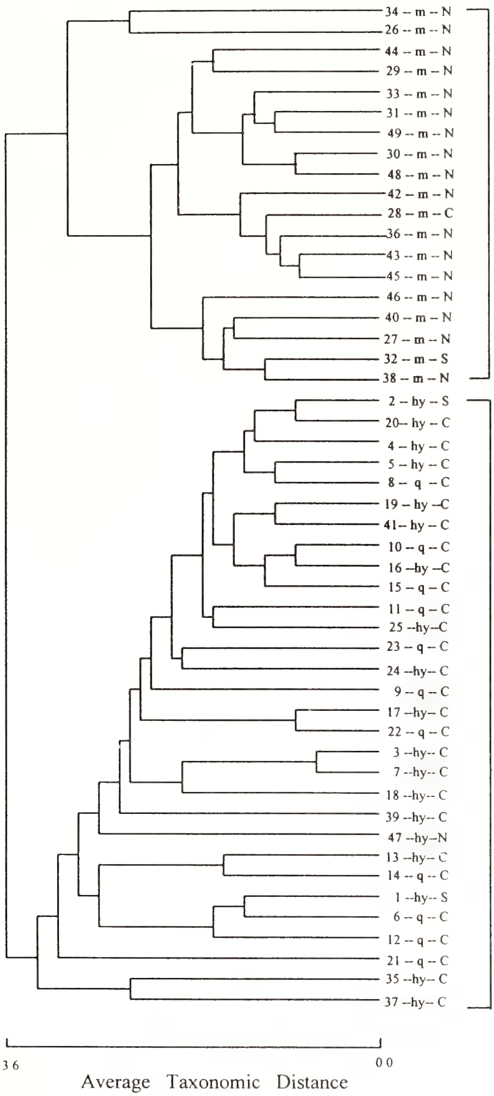

Figure 5. Phenetic relationships among accessions of *Muhlenbergia montana* and *M. quadridentata* as reflected by the cluster analysis (UPGMA) of the Canberra distance (Kovach 1987). Cophenetic correlation 0.923. Population numbers correspond to those in Tables 3 & 4. N= Northern populations, C= Central populations, and S= Southern populations.

Table 5. Percentage of pollen sterility in suspected hybrids.

OTU	Collector #	Locality	Altitude	Good Pollen	Aborted Pollen
1	*H&C 899*	Sierra de Juárez, Oax.	2950 m	98%	2%
2	*H&C 900*	Sierra de Juárez, Oax.	3000 m	70%	30%
3	*H&C 933*	Nevado de Colima, Col.	3650 m	91%	9%
4	*VEGA 272*	Río Frio, Mex.	3050 m	UK	UK
5	*H&C 914*	Amecameca-Tlamacas, Mex.	3500 m	75%	25%
7	*H&C 917*	E del Popocatepetl, Pue.	3180 m	60%	40%
13	*H&C 927*	Lagunas de Zempoala, Mex.	2900 m	98%	2%
16	*H&C 904*	Nevado de Toluca, Mex.	3400 m	60%	40%
17	*H&C 935*	Nevado de Colima, Col.	3740 m	82%	18%
18	*H&C 936*	Nevado de Colima, Col.	4000 m	70%	30%
19	*H&C 929*	La Marqueza, Mex.	3100 m	0%	100%
20	*H&C 908*	Sultepec, Mex.	2100 m	98%	2%
24	*MANCERA 1*	Tulancingo, Hgo.	2240 m	UK	UK
25	*H 241*	Sierra de Alcaparrosa, Mex.	2600 m	UK	UK
35	*H&C 924*	Ajusco, D.F.	3350 m	55%	45%
37	*H&C 928*	Lagunas de Zempoala, Pue.	3170 m	86%	14%
39	*H&C 922*	Ajusco, D.F.	3260 m	0%	100%
40	*H,P&A 972*	Batopilas, Chih.	2245 m	0%	100%
41	*H&C 926*	Lagunas de Zempoala, Mex.	2960 m	46%	54%
42	*H 970*	Batopilas, Chih.	2105 m	0%	100%
46	*H,P&A 964*	Creel, Chih.	2380 m	0%	100%
47	*H&A 984*	Sierra de Michis, Dgo.	2500 m	99%	1%

PCA of the population data (Tables 3 & 4) resulted in complete separation between the species into three groups representing *Muhlenbergia montana, M. quadridentata,* and their putative hybrids with intermediate scores.

Results from pollen analyses (Table 5) have shown individuals with abortive spores for the intermediate forms that overlap with both species. Populations from the mountains of the Trans-Mexican Volcanic Belt (D.F. and México states) and Sierra Madre Occidental (Chihuahua state) contains 100% abortive spores, this supports the position that *Muhlenbergia montana* and *M. quadridentata* are distinct species that interbreed to form sterile intermediates.

The nature of the character differences between the two species also suggests that *Muhlenbergia quadridentata* is not simply an ecological variant of *M. montana*. If it were, we would expect them to differ in features that are strongly susceptible to environmental modification, such as leaf length or overall size. While they do differ in some of these characteristics, the best characters to distinguish *M. quadridentata* from *M. montana* are: The glumes are subequal and truncate, and the second glume is 3-4 toothed to erose in the former; while the glumes are unequal and apiculate, and the second glume is sharply 3-toothed, mucronate to shortly aristate in the latter. Anatomically *M. montana* presents two secondary Vascular bundles (Vb) placed among the primary ones, Vb's are circular in outline, and the girder is present adaxially and abaxially, as mentioned in Herrera-Arrieta & Grant (1994); while *M. quadridentata* presents only one secondary Vb between the primary, the Vb's are elliptical in outline and the girder is present just abaxially. Flavonoid profiles are also good characters to easily separate these two species (Herrera-A. & Bain 1991).

Unfortunately few chromosome counts of these two species were successful in this work, meiotic counts were possible in three of all the collected populations (Herrera-Arrieta 1995), where *Muhlenbergia quadridentata* showed n=10, *M. montana* n=10 and n=20. Attempts to grow these species under greenhouse conditions for mitotic counts were unsuccessful. Earlier published chromosome counts for *M. montana* are n=20 (Reeder 1968).

Pollen size varies from 20 to 25 μ in *Muhlenbergia quadridentata* and from 15 to 35 μ in *M. montana*, however, no correlation between the ploidy level and pollen sizes was established among the populations of this work. The differences in ploidy level between these two species validate a generalization from Stebbins (1950) about the relative distribution of diploids and polyploids. This author states that changes caused by polyploidy can often promote the adaptation of the new types to entirely different habitats from those occupied by their diploid ancestors. The polyploidal level shown by *M. montana* combined with its probable hybridization to other species (*M. filiculmis* in the USA and *M. quadridentata* in México) gives a wider pattern of distribution to it.

Our studies have shown a polarized distribution (north, central-south) in the three data sets examined. The geographical distribution of *Muhlenbergia montana* occurs mostly in northern populations, while *M. quadridentata* and hybrid swarms are found in central and southern populations.

CONCLUSIONS

Recognition of *Muhlenbergia quadridentata* as a species distinct from *M. montana* is supported by this study. The two species differ mostly in glume shape and size, vascular bundle outline and number, flavonoid profiles, and ploidy level. The two taxa differ in some habitat preferences, they never grow in mixed populations, *M. montana* occurs at altitudes ranging between 2100 and 2700 m, in oak and pine forests, and even in mesophytic forest, forming small clumps; while *M. quadridentata* occurs at higher altitudes (up to 4100 m) in pine forests and alpine grasslands, forming big bunches which cover a large area. The hybrids exhibit morphological and anatomical intermediates, and mixed flavonoid profiles. Principal Component Analysis of natural populations of these two taxa demonstrates clear separation between the well defined species with the sterile hybrids intermediate between them. The two groups obtained from the cluster analysis suggest that there has been reduced gene flow between the northern and central-southern populations. The patterns of variation observed in allopatric populations of this species pair at central and southern sites fits the model of production of hybrid swarms summarized in Grant (1956).

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A NEW SPECIES OF *CERASTIUM* (CARYOPHYLLACEAE) FROM OAXACA, MEXICO

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ABSTRACT

Cerastium hintoniorum B.L. Turner, *spec. nov.*, is described and illustrated. It is known only from Distr. Miahuatlán, Oaxaca, where it occurs in pine-alder forests at 3050 m on Cerro Quiexobra. Among North American species it is most closely related to *C. guatemalense*, differing from the latter in a number of characters, most notably leaf vestiture and fruit size.

KEY WORDS: Caryophyllaceae, *Cerastium*, México, Oaxaca, systematics

Exploration of remote, relatively poorly collected areas of México has yielded the following novelty.

CERASTIUM HINTONIORUM B.L. Turner, *spec. nov.* Figure 1. TYPE: MEXICO. Oaxaca: Distr. Miahuatlán, Quiexobra, 3045 m, "pine and alder forests," *G.B. Hinton* et al. *26114* (HOLOTYPE: TEX).

Similis *C. guatemalensi* Standley, sed foliis sparsim appressis, ubique pilosis (vice foliorum glandulosorum - pilosorum infra), petalis parvioribus, ca. 5 mm longis (vice 6-7 mm longis), et capsulis multum majoribus 12-16 mm longis (vice "7.8-11.8" longis [Good 1984]).

Perennial (?) sparsely branched herbs 15-30 cm high. Midstems pilose with mostly eglandular hairs 0.5-1.0 mm long, upwards the vestiture becoming increasingly glandular-pilose. Leaves more or less similar in shape throughout, but gradually reduced upwards, the larger (lower) leaves, mostly 40-50 mm long, 5-6 mm wide, sparsely pilose on both surfaces with appressed hairs, not at all glandular-pilose. Cymes 8-12 flowered, the bracts not scarious-margined. Pedicels 10-35 mm long, the lower ones longer, moderately pilose like the upper stems, arcuate near the apices when in fruit. Sepals ovate-lanceolate, acute, ca. 5 mm long, 1.5 mm wide, the margins scarious along the upper half, sparsely glandular-pilose on the outer faces.

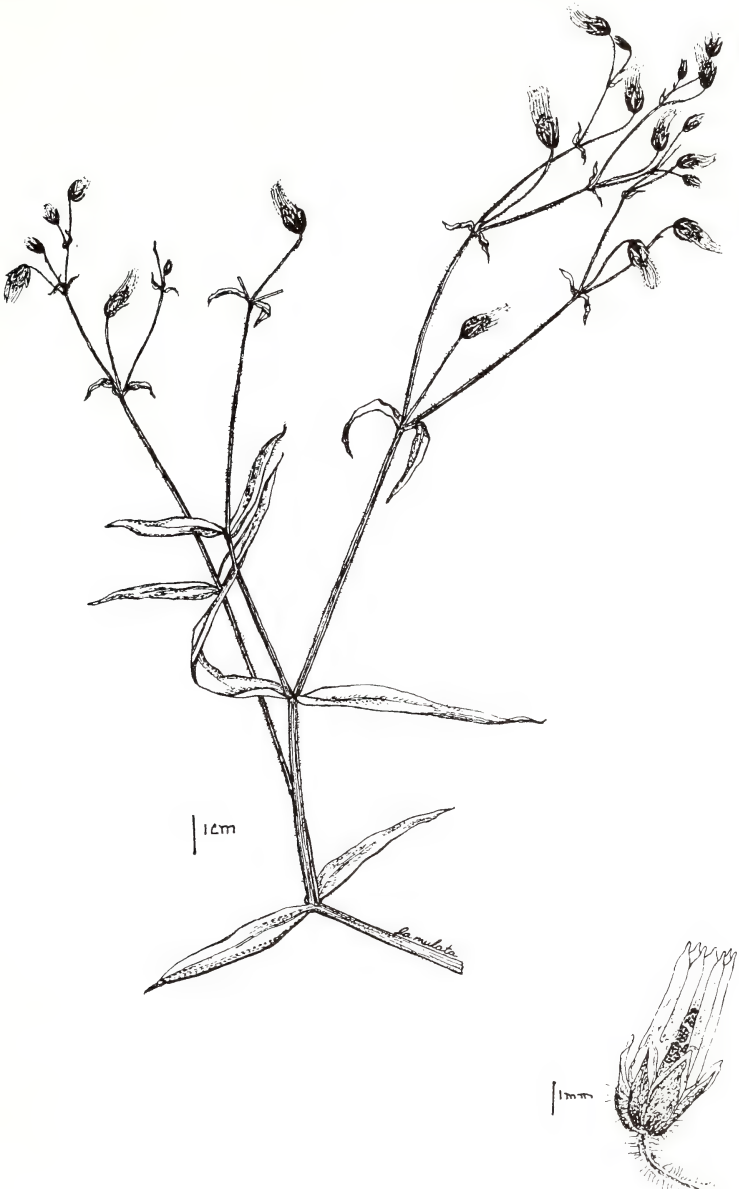

Figure 1. *Cerastium hintoniorum*, from holotype.

Petals white, ca. 5 mm long, bifid ca. 1/4 their length. Filaments ca. 3.2 mm long; anthers ca. 0.2 mm long. Capsules mostly 12-15 mm long, ca. 3.5 mm across, curved, the lobes 10, erect, ca. 0.8 mm long. Seeds ovoid, light brown, ca. 1.0 mm long, 0.9 mm wide, rugose throughout with rounded crests, less so laterally.

This novelty is closely related to *Cerastium guatemalense* Standley, and will key to that species in the excellent revisionary treatment of *Cerastium* for México and Central America by Good (1984). It differs from *C. guatemalense* in having eglandular leaves, smaller petals and much larger capsules (mostly 12-16 mm long vs. 7.8-11.8 mm long). In addition, *C. guatemalense* is known only from southwesternmost Chiapas, México (Mpio. de Motozintla de Mendoza), and closely adjacent Guatemala, with an outlier-population in Costa Rica.

It is a pleasure to name the taxon for the Hinton family, superlatives for which I do not have enough.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Ted Delevoryas for reviewing the manuscript. Maria Thompson provided the illustration.

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A NEW VARIETY OF *PERYMENIUM HINTONIORUM* (ASTERACEAE, HELIANTHEAE)

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ABSTRACT

A new variety of *Perymenium hintoniorum*, ***P. h.*** var. ***gypsophilum*** B.L. Turner, is described from southern Nuevo León. It is seemingly confined to gypsum soils and differs from the more northern var. *hintoniorum* of calcareous soils in having eglandular peduncles, smaller leaves and brown anthers. A map showing their distributions is provided.

KEY WORDS: Asteraceae, Heliantheae, *Perymenium*, México, Nuevo León, systematics

Routine identification of Mexican Asteraceae has revealed the following novelty.

PERYMENIUM HINTONIORUM B.L. Turner var. ***GYPSOPHILUM*** B.L. Turner, *var. nov.* TYPE: MEXICO. Nuevo León: Mpio. Aramberri, along road from Aramberri to El Salitre, 1325 m, 26 Oct 1993, *Hinton et al. 23749* (HOLOTYPE: TEX!).

A *P. hintoniorum* B.L. Turner var. *hintoniorum* folia parviora, 3-4 cm longa (vice 8-10 cm longa), et antheras brunneas (vice lotearum) habendo et solum en soliis gypseis (vice calcareorum) crescendo diagnoscendum.

Suffruticose much-branched perennial herbs or shrublets 40-60 cm high. Leaves mostly 3-4(-7) cm long; petioles 2-8 mm long; blades ovate, having 3 principal veins, pubescent above and below with coarse hispid to pilose hairs, the margins serrate to nearly entire. Heads single on eglandular, sparsely strigose, peduncles 3-6 cm long. Involucres ca. 6 mm high, 6-10 mm wide (pressed); bracts 3-seriate, moderately strigose, the outer series broadly ovate, ca. 4 mm long, the inner lanceolate, ca. 6 mm long. Receptacle plane, the bracts linear- lanceolate, persistent. Ray florets 5-11, the ligules yellow. Disk florets 25-40; corollas yellow, ca. 6 mm long, glabrous except

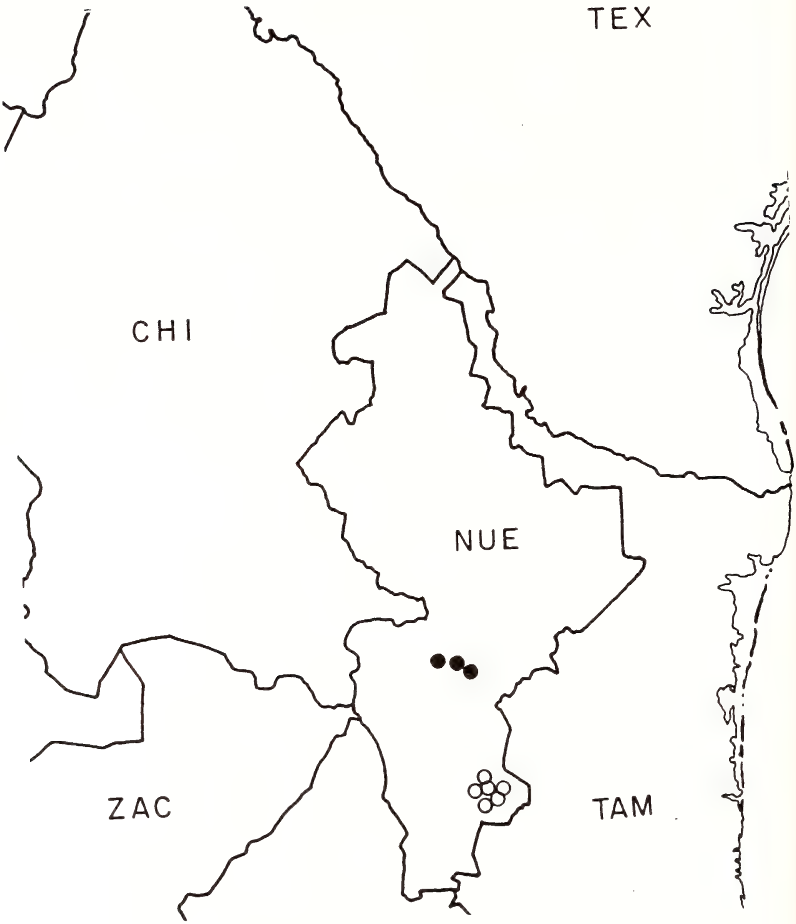

Figure 1. Distribution of varieties of *Perymenium hintoniorum*.

for the hispidulous lobes. Anthers brown. Achenes 3-angled (ray florets) to radially flattened (disk florets), ca. 3 mm long, 1.8 mm wide; pappus of 10-20 deciduous bristles 2-4 mm long.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Nuevo León: Mpio. Aramberri, S of La Escondida, gypsum hillside, 1820 m, 16 Oct 1993, *Hinton et al. 23596* (TEX); Aramberri to El Salitre, gypsum hillside, 1325 m, 26 Oct 1993, *Hinton et al. 23733* (TEX); road to Dolores (from Aramberri), gypsum hills, 1255 m, *Hinton et al. 23855* (TEX). Mpio. Zaragoza, W of Zaragoza, gypsum hillside, 1460 m, 16 Oct 1993, *Hinton et al. 23645* (TEX); 19 km S of Zaragoza (23° 40′ N, 99° 48′ W), 1950 m, 18 Nov 1993, *Villarreal y Carranza 7560* (TEX).

As indicated in the diagnosis, var. *gypsophilum* is distinguished from the typical variety in having smaller leaves, eglandular peduncles and brown anthers. So far as known, it is confined to gypseous soils of southern Nuevo León (Figure 1).

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Justin Williams for reviewing the paper.

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THE NATURAL HISTORY OF SOUTHWESTERN CHIHUAHUA, MEXICO IN THE 1930'S

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ABSTRACT

A summary of conditions is given for southwestern Chihuahua during the 1930's. This summary is based on the experiences of the author as he lived, worked, and botanized in that area.

KEY WORDS: México, Chihuahua, ecology, historical summary

RESUMEN

Se presenta un sumario de condiciones del sudoeste de Chihuahua durante la década de los años 1930. Este sumario esta basado en las experiencias del autor durante el período en que vivió, trabajó, y estudió la flora de la región.

PALABRAS CLAVE: México, Chihuahua, ecología, sumario histórico

The Sierra Madre of western Chihuahua has been inhabited for many years by such Indian tribes as the Tarahumaras and the Tepehuanes. The ethnobiology of these tribes has been narrated by various writers such as Bennett & Zingg (1935), and Pennington (1963, 1969). Some prominent nineteenth century biologists who made serious studies there were Edward Palmer (in McVaugh 1956; Robinson & Fernald 1884-1895), Edward Nelson and Major Edward Goldman (Goldman 1951), and certain scientists with the several Carl Lumholtz expeditions (Lumholtz 1902). In this century are the works of Wilmer Tanner in herpetology (Tanner & Robinson, Jr. 1959), Sidney Anderson on mammals (Anderson 1972), and botanists Bailey & Wendt (1979), Bye, Burgess, & Trias (1975), Bye & Soltis (1979), Bye & Constance (1979), Clausen (1975), Correll (1962), Deghan & Webster (1978), Gentry (1942), Knobloch (1942-1983), Lindsay (1943), Mathiasen (1979), Spellenberg (1978), Wiens (1964), and Ayers (1987). The Chihuahuan Desert has been and continues to

be investigated intensively, but it is my opinion that the Sierra Madre Occidental which covers much of southwestern Chihuahua, still holds many surprises for the biologist.

I will essentially confine my remarks and observations to the areas around two towns, only dealing casually with other areas where I collected starting in 1937. The first locale is Mojarachic with a latitude of 27° 52′ N, longitude of 107° 55′ W, and an elevation of approximately 6900 feet (2103 m). The other town is Maguarichic at the same latitude, longitude of about 107° 59′ W, and at an undetermined elevation but approximately 1494 meters. These mining towns were not usually to be found on any map, but I was recently sent the Maguarichic section of a map on the scale of 1:50,000 by Dr. Tina Ayers which shows both places. Both towns are sometimes spelled without the final "c".

Mojarachic boasted only one or two permanent, and no more than 30 temporary families when the silver mine was in operation in the late 1930's. The mine was unprofitable and closed down shortly after I terminated my employment there in 1940 to pursue my doctorate at Iowa State in Ames. I am now able to report that the road to this site is impassable by truck due to washouts. Dr. Tina Ayers is the authority for this late information based on her personal experience. Maguarichic was a silver and gold mine easily reached by horse from Mojarachic (and by car from San Juanito) and there were several thousand persons there with most of the men being employed by the mine. This mine proved to be a huge success and it was believed that ore valued at about $15 million U.S. was extracted in just a short time. Modern maps now show a fine graded road going as far as Maguarichic.

Based on information which I have received from mining experts at the University of Texas--El Paso, the visible rocks are volcanic in origin. The buff-colored surface rock is rhyolite and underneath this type is a bluish andesite in which one usually located the gold and silver-bearing quartz veins. Several miles from Mojarachic I have seen cliffs of basalt. Sedimentary Cretaceous limestone is present in many parts of Chihuahua and is assumed to underlie the andesite mentioned above.

Small streams easily cut into the soft rhyolite and coalesce with others until they eventually drained into the large Río Fuerte which empties into the Gulf of California. The Sierra Madre contains a number of deep canyons (Urique, Cobre, Tararecua, Verde, Oteros, and Batopilas) and the terrain is very rugged indeed. Three of these canyons or barrancas will be mentioned below. Only occasional flat areas can be cultivated and in the 1930's the field workers used home-made wooden plows. As the furrow was made, another worker punched a hole in the furrow, dropped in a seed (fruit) and kicked the earth over the seed or fruit with his foot. Nature was then left to "take her course."

There were few cows to be seen and some ranchers favored goats. My wife and I possessed one female goat which furnished us with an ample supply of delicious milk. For meat we were able to select from several hundred chickens. Our other livestock consisted of a pair of horses, a pair of peacocks, and several turkeys. Our drinking water was carried from a hillside spring and dumped into an oil drum attached to the living quarters with a faucet in the kitchen. The water sometimes contained live salamanders.

Sons were highly prized in our area because they were put to work early and they turned their earnings over to their parents. Health care was almost non-existent. The Maguarichic mine had a small medical facility and their x-ray machine showed that an almost severed finger tip of mine would heal just fine. However, a few days later I noticed that gangrene had set in and a long, hurried trip by car, truck, and train to an El Paso, Texas hospital was imperative. Being before the use of penicillin, the doctor had to extract the poison by using flaxseed poultices and this he did one day short of cutting the arm off at the wrist. The dentist there (in Maguarichic) specialized in pulling teeth, a talent which my wife has always regretted. When the same young lady developed hepatitis, she had to go all the way to El Paso for treatment.

Law enforcement was in its infancy and there were posses going around regularly. Those who could afford to own a gun always carried it when away from their ranchito. Few natives wore eyeglasses or had store furniture because of the cost.

In the 1930's there was an east-west railroad in Chihuahua running from Ojinaga (opposite Presidio, Texas) to Creel. Its name was Kansas City, Missouri, and Orient and there is quite a story connected with its building. The wood-burning train boarded at Chihuahua City by us, was a combination passenger and freight outfit which stopped at every town and hamlet. Consequently, the trip to San Juanito, our destination, sometimes took as long as 22 hours. Children and adults sold food from napkin-covered baskets at almost every stop. Kerosene lanterns swayed from the ceilings of the passenger cars as the train slowly creaked along the worn-out road bed. Some cars had many bullet holes in them. How different it is today. In a remarkable engineering feat, the Mexican government has carried the railroad through very difficult terrain as far as Los Mochis on the Pacific side by means of many tunnels and bridges, thus providing the passengers with spectacular views of Chihuahua's barranca region. Modern lodges and hotels now enable the tourist an opportunity to stay a while and savor the beauty. The new railroad is named Ferrocarril de Chihuahua al Pacifico S.A. de C.V. México.

It is not possible to fully describe the physical features and ecological zones of Chihuahua in this short article; rather the reader can be referred to pages one to five of the book- "*Ferns and Fern Allies of Chihuahua, Mexico*," (Knobloch & Correll 1962) for a summary and the names of well-known students of the subject. It is possible that the above-mentioned book can be purchased at The Bookstore, University of Texas at Dallas, 2601 N. Floyd Rd., Post Office Box 688, Richardson, Texas 75080. Although I did some collecting in the central, more arid areas of Chihuahua, most was done on either side of the Continental Divide. The eastern or Atlantic side of the Divide features eroding mountains with many beautiful, flower-filled meadows in season. The Pacific drainage embraces most of the great barrancas of the state.

The Mojarachic area was in a transition zone of pines and oaks on the Pacific front but there were many other arborescent as well as shrubby taxa such as *Arbutus, Ilex, Ceanothus*, and *Arctostaphylos*. Although the rains did not start until May, some taxa were in flower in January and February such as *Salix* spp., *Arctostaphylos pungens* H.B.K. *Cupressus arizonica* E. Greene, *Juniperus*, and *Acacia* spp. In March we noted *Ceanothus buxifolius* Willd., *Dalea* cf. *formosa* Torr., *Viola* spp., and *Potentilla knoblochii* Standley, among others. April brought out the blossoms of various oaks, *Gaultheria glaucifolia* Hemsl., *Ilex* cf. *rubra* S. Wats., *Arbutus xalapensis* H.B.K., and *Opuntia* spp. May finds the bracken fern's croziers unrolling and some pines are

demonstrating new shoot growth. Many taxa are now coming into flower as we get into July, including *Hypoxis* sp., *Bouvardia glaberrima* Engelm., and *Ipomoea madrensis* S. Wats. The ericaceous *Pterospora andromeda* Nutt. was in flower in August, but my favorite flower, *Milla biflora* Cav. seems to be at its best in September.

As mentioned above, Maguarichic is lower, has less rainfall, is more arid and the vegetation might be called Short-Thorn. The lower slopes and bottoms of the great barrancas can likewise be called Short-Thorn or Tropical Deciduous Forest with large cacti, sizable *Bursera* and fig trees with *Crescentia alata* H.B.K. trees occasionally seen. Where the federal railroad nears the Sinaloa border and, also west of Guadalupe y Calvo the vegetation is semi-tropical or tropical depending on elevation and other factors. Sierra Mohinora, reached from the same town, may be in the Boreal Zone at its summit (about 3200 meters).

It is not possible to describe in this article all of the places I visited in Chihuahua, but it may be useful to some to know that I also examined the plant life in the vicinity of Guachochic (flying out of Cd. Chihuahua, including the Barranca Sinforosa and the area around the town of Guadalupe y Calvo (flying out of Hidalgo de Parral).

The ethnobiology of the region has been dealt with earlier by Bennett & Zing (1935), Pennington (1963, 1969) and lately by Bye, Burgess, & Trias (1975) and will not be discussed here. Modern medicine can still learn about possible uses of native Mexican plants.

In the late 1930's I left Mojarachic where I was employed, for San Juanito by truck, took the old train to Creel, and then proceeded to a mine in the Barranca del Cobre by truck and then by horse. There, as the guest of the late Mr. and Mrs. Zehtner, I spent two weeks exploring this famous canyon. Copper has been mined by various companies there since the late nineteenth century. The barranca is about 3,000 feet (914 m) deep from the top to the mine and it was here that I saw my first *Psilotum* and my first *Ficus*. I also saw my first river otter, an animal which the late Major Edward Goldman of the Smithsonian Institution did not believe occurred there. The natives in the canyon occasionally hunted for them for their valuable fur. The name of the river is the Río Urique, which runs westward until it reaches a hard rock formation at which point it runs south into the Barranca Urique, a deeper canyon than the Copper Barranca.

The depth of the Barranca Urique from the town of Cerocahui at the top, to the town of Urique at the bottom, was estimated to be about 5800 feet (1770 m) by Dr. Sidney Anderson (1972 and pers. comm.). Dr. Anderson's 1972 contribution was on the mammals of Chihuahua. Incidentally, on page 214, Anderson quotes Dr. Villa as saying that Mojarachic is the same place as Maguarachic but this is not correct according to the late map consulted. I have been down in the Barranca Urique twice; the first time was with Dr. Gerald Prescott (in 1954), a well-known algologist. We went in from a trail south of Creel before the new rails were laid. The second trip to the town of Urique was with Dr. Wilmer Tanner, a well-known herpetologist (in 1958).

It is well to add that the entire barranca region is inhabited by the cave-dwelling Tarahumara Indians. At the time of our trips there were said to be about 25,000

members of this tribe. Modern medicine is reaching these taciturn people and will improve their health but putting their men in blue jeans and so forth will probably destroy some aspects of their fascinating life style. Those family groups holding to their ancient customs will farm small areas at the top of the barrancas in the summer and practice their agriculture at the bottom in the cold winter months.

One more barranca should be mentioned, namely that enclosing the Río Batopilas. My main focus was the town of Batopilas where Edward Palmer (American botanist) worked in 1885 (Vasey & Scribner 1886-1887; Watson 1882-1883, 1886 a,b). The rare fern plants I was seeking were *Asplenium modestum* Maxon which I did not find, and *Cheilanthes weatherbiana* R.M. Tryon, which I did find. Lately, Dr. T. Reichstein of Basel, an expert in the genus *Asplenium*, has sent his co-worker Christopher Fraser-Jenkins twice to Batopilas to locate *A. modestum*. At this time, this rarity has not been rediscovered. My trip to this small town was in 1957 by truck from Creel to the Carmen Mine at La Bufa in the Batopilas Canyon, and thence by burro to the town. Now a fine road from Creel enters the town.

Of the 2832 sheets of plants collected by me in México, about 2300 of them were taken in Chihuahua. This is so because of my early residence there in the late 1930's and my later trips sponsored by the NSF to complete copy for the book by the late Dr. Donovan Correll and myself, mentioned earlier. The bulk of my specimens are at MSC, US, F, and MICH, but others are scattered among TEX, SBDG, SMU, WAHL, WIS, PENN, BM, RSA, MO, TAES, RM, MINN, MEXU, ENCB, DS, CHAPA, LL, CSLA, CAN, SD, CU, NY, NA, and UC.

Since my training included many courses in zoology, I could not resist noticing the fauna of a region I knew to be unexplored. Most of this sampling was done in the Mojarachic-Maguarichic region. Holo- and paratypes of a new salamander, *Ambystoma rosaceum* Taylor, were located at Mojarachic (Taylor 1941). This is the same creature we found in our drinking water.

Taylor (1940b) also described the holo- and paratypes of a snake, *Lampropeltis pyromelana* Taylor subsp. *knoblochii* Tanner (as *L. knoblochii*). This was from Mojarachic, as well as a new frog, *Hylactophryne tarahumaraensis* Taylor (as *Eleutherodactylus tarahumaraensis* (Taylor 1940a). Legler (1959) described a new snake, *Geophis aquilonaris* Legler but this has now been reduced to the subspecies level under *G. dugesii* Boucort.

A new species of fern was discovered in Nuevo León (a state in northeastern México) a fern long confused with *Cheilanthes tomentosa* Link. The holotype of this taxon, *C. chipinquensis* Knobloch & Lellinger is at US. *Briquetia inermis* Fryxell was found at La Bufa, s.e. of Creel, Chihuahua with the holotype at ENCB (Fryxell 1976). *Lobelia knoblochii* T. Ayers (Ayers 1987) was recently named with the holotype (F) coming from Mojarachic. *Tillandsia cretacea* L. Smith (at U.S.) came from La Bufa, s.e. of Creel and was described by Lyman Smith (1974). *Solanum citrullifolium* A. Br. var. *knoblochii* M. Whalen was located at the railroad town of San Juanito and named by Whalen in 1976. The last two new taxa came from Mojarachic. One was *Potentilla knoblochii* Standley with holotype at F (Standley 1940). The second was *Quercus knoblochii* C.H. Mull. (1942), probably a hybrid between *Q. coccolobaefolia* Trel. and *Q. viminea* Trel. The holotype is at F.

A list of all my collections is in a storage room in the herbarium at Michigan State University and a copy has been sent to Dr. Bye; the receipt of this list was acknowledged by him. A card file on the flowering plants collected in all of Chihuahua by other collectors was sent to Dr. James Henrickson and the receipt of this was acknowledged by him. Both of these items are potentially useful, but continuing taxonomic refinement of the names will have to be made.

The entire Sierra Madre Occidental, especially in the states of Chihuahua and Durango, can be very fruitful to both zoologists and botanists. Many areas remain to be explored and I especially recommend the southwest corner of Chihuahua near the Sinaloa border.

ACKNOWLEDGMENTS

I have found the Mexican government officials, the professional staffs of the Mexican universities, and the people I met in the small towns to be both helpful and gracious. I shall always be in their debt.

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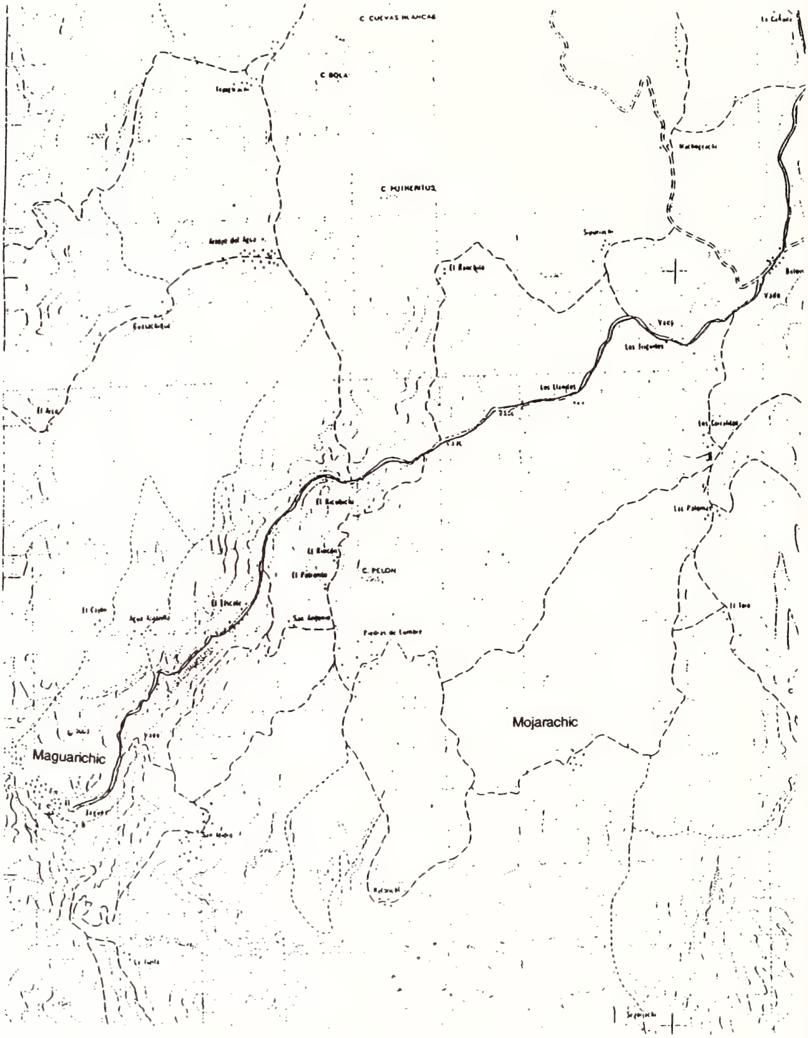

Figure 1. A drawing made in the Geography Department, Michigan State University, of a section of a map produced by the Republic of México, Centenal map (Instituto Nacional de Estadistica Geografía y Informatica, G13 A11, 1979) labeled "Maguarichic" on a scale of 1:50,000 to show the exact location of Maguarichic, Mojarachic, and Segorichic.

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CERASTIUM TEXANUM (CARYOPHYLLACEAE) DOES NOT OCCUR IN TEXAS

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ABSTRACT

Cerastium texanum Britt. is typified by material collected by Charles Wright during the period March-April of 1852, while he was engaged in a Mexican Boundary Survey under the direction of Major W.H. Emory. Britton, in naming the species, apparently thought the collection site, "Hills, Blanco..." [handwritten label data attached to the collection concerned] was in Texas, perhaps in reference to Blanco, Texas, a well known locale in central Texas located in southern Blanco County. The village of Blanco was established in 1853, after Wright collected type material. A careful retracing of Wright's itinerary during his work with the Mexican Boundary Survey suggests that the species was probably collected in north-central México or possibly in closely adjacent New Mexico. Collections of *Cerastium texanum* are unknown from Texas. In addition to clarification of its typification, a map showing its distribution is provided, along with a key and distributional maps for the five species of *Cerastium* currently known to occur in Texas.

KEY WORDS: Caryophyllaceae, *Cerastium*, Texas, México, systematics

Cerastium is a relatively large, mostly Eurasian genus with 100 or more described species, some of these widely introduced elsewhere as weeds. According to Correll & Johnston (1970), Texas has seven native and/or introduced species of *Cerastium*, including *C. clawsonii* Correll (now known to be a species of *Linum*: cf. Hartman 1979; Johnston 1990), and *C. texanum* Britt., the latter presumably not occurring in Texas as noted in the above abstract, in spite of statements to the contrary (Correll & Johnston 1970; Good 1984). With these two species removed Texas can now be said to harbor five species of *Cerastium*: *C. axillare* Correll, *C. brachypodum* (Engelm. *ex* A. Gray) B.L. Robins., *C. fontanum* Baumg., (=*C. vulgatum* L. of Correll & Johnston), *C. glomeratum* Thuill., and *C. nutans* Raf.

A key to these five taxa, along with comments upon their occurrence, distribution, and synonymy, follows.

KEY TO TEXAS *CERASTIUM*

1. Flowers arranged in dense terminal glomerules, their pedicels mostly 1-3 mm long..*C. glomeratum*
1. Flowers not as described in the above, their pedicels mostly 4 mm long or more. ....(2)
   2. Petals about equal to or shorter than the sepals..................................(3)
   2. Petals decidedly longer than the sepals...(4)
3. Flowers arising single in the leaf axils along much of the stem; bracts of the inflorescence without scarious margins.......................................*C. axillare*
3. Flowers not as described in the above, mostly arising 2 or more from the leaf axils along the uppermost portions of the stem; bracts of the inflorescence with scarious margins...*C. fontanum*
   4. Leaves along lower portion of stem mostly 3 cm long or less; fruiting pedicels about as long as the capsules, straight or only slightly arcuate or recurved; common in eastern Texas...*C. brachypodum*
   4. Leaves along lower portion of stem mostly 4 cm long or more; fruiting pedicels much longer than the capsules and markedly recurved near their apices; rare species of western Texas..*C. nutans*

CERASTIUM AXILLARE Correll, Figure 1.

This taxon occurs in trans-Pecos Texas and closely adjacent México, mostly in shady igneous soils along ledges and seeps from 5000-6000 feet; March-May (September).

CERASTIUM BRACHYPODUM (Engelm. *ex* A. Gray) B.L. Robins., Figure 2.
Cerastium nutans Raf. var. *brachypodum* Engelm. *ex* A. Gray

Cerastium brachypodum is fairly common in east-central Texas, occurring in mostly disturbed calcareous soils; February-April.

Good (1984) recognized this taxon as a distinct species, as did Correll & Johnston (1970), although some workers would treat it as a variety of *Cerastium nutans*, as noted in the above synonymy. *Cerastium nutans* is reportedly "uncommon in Texas", which seems to be the case for I have not examined specimens from the state as noted below, although it is fairly common in México and elsewhere in North America (Good 1984).

CERASTIUM FONTANUM Baumg., Figure 3

This is the name applied by European workers to what was formerly referred to as *Cerastium vulgatum* L. It is relatively uncommon in Texas, as indicated in Figure 3.

Figure 1. Distribution of *Cerastium axillare* (closed circles) and *C. fontanum* (open circles) in Texas.

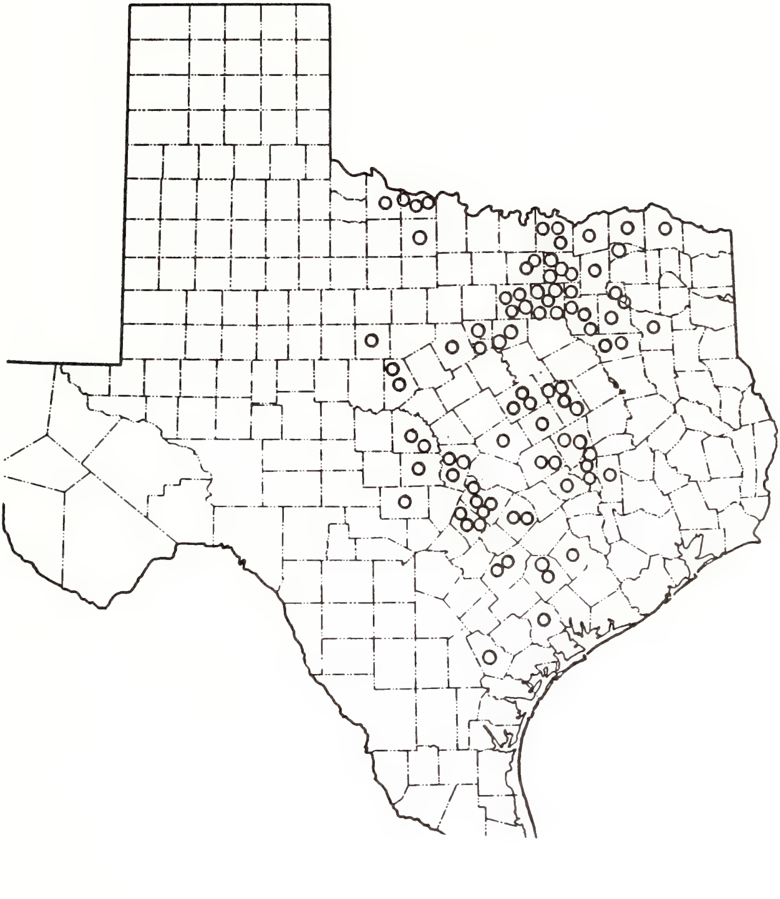

Figure 2. Distribution of *Cerastium brachypodum* in Texas.

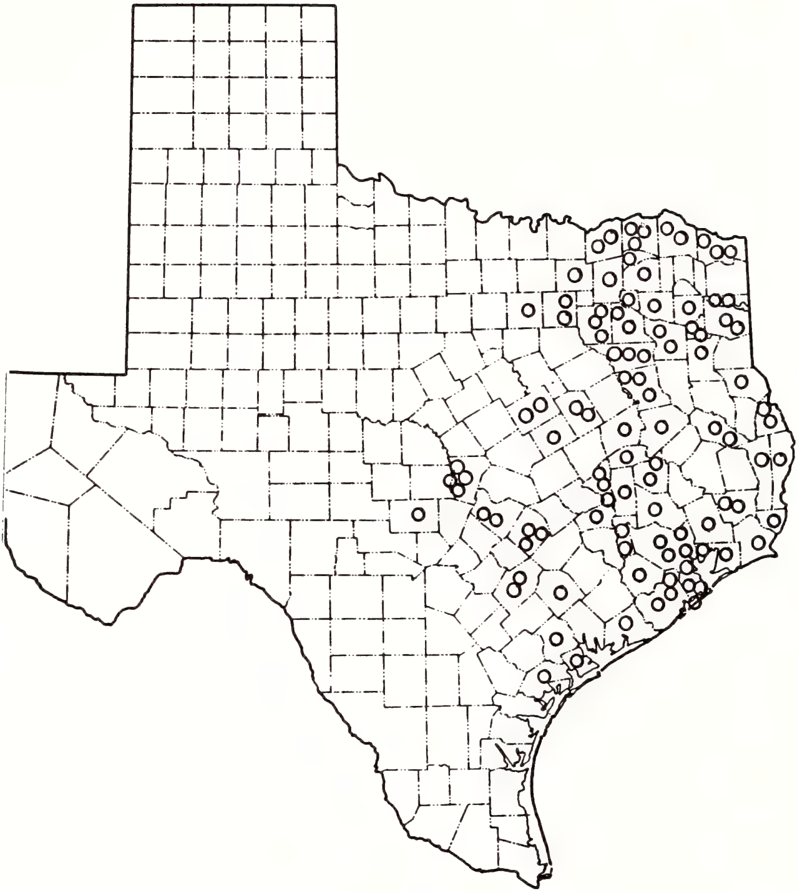

Figure 3. Distribution of *Cerastium glomeratum* in Texas.

CERASTIUM GLOMERATUM Thuill.

This introduced weedy species is typified by material from France (Good 1984) and is a relatively common weed in México and Central America, likewise in eastern Texas.

CERASTIUM NUTANS Raf.

According to Correll & Johnston (1970) this weedy species is common across much of the U.S.A. and parts of México, but is "uncommon in Texas." Indeed, I have not seen collections from the state.

CERASTIUM SPECIES RECOGNIZED FOR TEXAS BY CORRELL & JOHNSTON BUT EXCLUDED FROM THE PRESENT ACCOUNT

CERASTIUM TEXANUM Britt., Bull. Torrey Bot. Club 15:97. 1888. TYPE: MEXICO (?). Chihuahua(?). "hills, Blanco", Mar-Apr 1852, *C. Wright 69* (HOLOTYPE: NY!). In the protologue Britton notes that "This very distinct species is represented in the Torrey Herbarium by half a dozen fragments, and does not appear to have been distributed." All of the fragments are mounted on a single sheet, the holotype.

Stellaria montana Rose, Contr. U.S. Natl. Herb. 1:93. 1891. TYPE: MEXICO. Sonora: Alamos Mountains, *E.J. Palmer s.n.* (HOLOTYPE: US).

Good (1984) has given an excellent description and account of this taxon, including the above synonymy. Unfortunately he accredited its occurrence in Texas largely to Correll & Johnston (1970), not having seen specimens himself. No doubt he was also misled by the epithet of the species, along with ignorance as to its type locality. When he first described it, Britton applied the name "*texanum*" to the taxon, presumably under the assumption that the type material had been obtained from the hills about Blanco, Texas, or perhaps along the Blanco River of central Texas. But the material concerned, to judge from label data, was probably collected in northern México or New Mexico during April-May, 1852, while Wright was connected with the Mexican Boundary Survey. The village of Blanco, Texas, was not established until 1853 (Webb 1952) and there is no indication that Wright ever collected in the vicinity of this locality. Indeed, from what is known about the distribution of the species, Wright probably collected the type in northcentral Chihuahua during the period 17-23 April, 1852, during a brief side trip to that region out of El Paso, Texas. While detailed field notes from this phase of Wright's journey are lacking (Johnston 1940), one can infer the place or area of likely collection: a Mexican village or watercourse in this area with the name "Blanco". It is also possible, however, that Wright collected the species somewhere in southern New Mexico, for he also was in this area during the period Mar-Apr 1852, and this region also possesses populations of *C. texanum* (as indicated in Figure 4). Johnston (1940) notes that Wright spent the period March-April surveying the Rio Grande from El Paso, Texas to old Fort

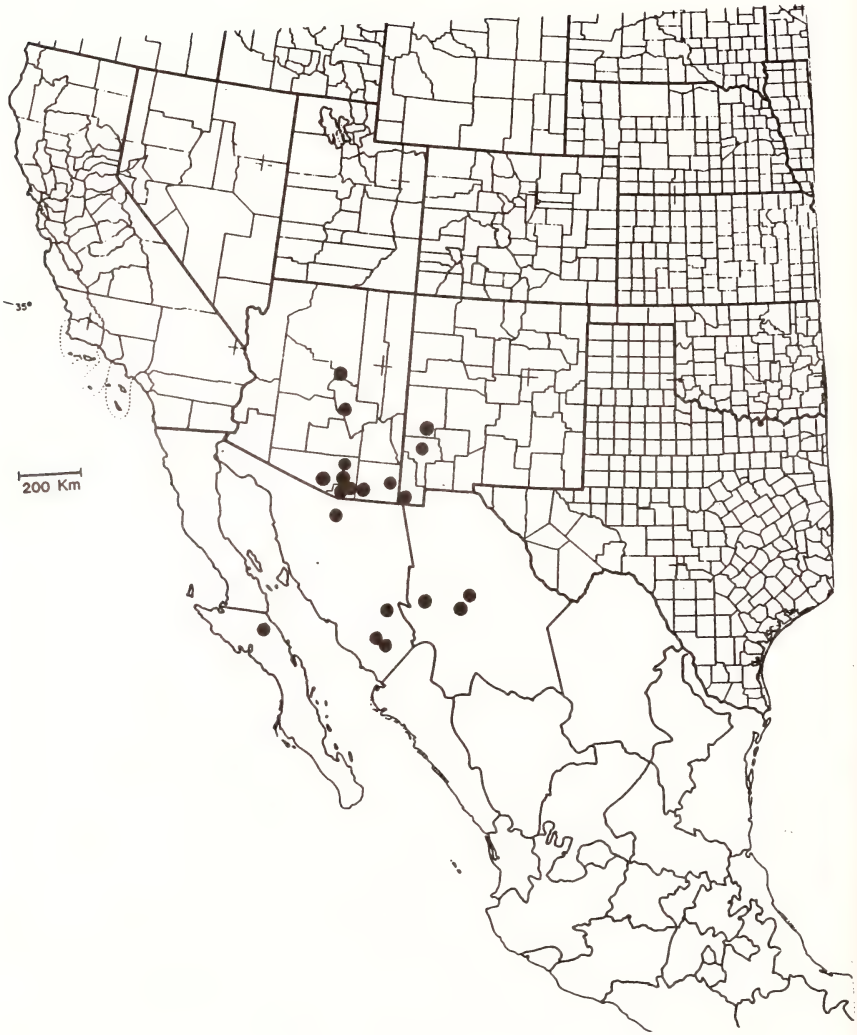

Figure 4. Distribution of *Cerastium texanum*.

Quitman in present day Hudspeth County, Texas, except for the venture to northcentral Chihuahua, México, mentioned in the above account. During the period 29-30 April, however, Wright did collect in the Organ Mountains of New Mexico.

CERASTIUM CLAWSONII Correll, Wrightia 4:25.1968.

As first noted by Hartman (1979), this taxon belongs to the genus *Linum* of the family Linaceae where it can by synonymized with *Linum hudsonioides* Planch. When Dr. Ron Hartman (currently at WYO) detected this error, I suggested that he call it to the attention of its author, D.S. Correll, and he did. Correll was not especially admonished by the revelation; indeed, he merely responded to Hartman, cheerfully I imagine, knowing his personality, that someone should set the record straight, but as a lame excuse he added that he was unfortunately misled as to its identity by some careless annotation on the type specimen to the effect that it was a species of *Arenaria*, which he knew it not to be!.

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TAXONOMY AND NOMENCLATURE OF *SCHKUHRIA PINNATA* (ASTERACEAE, HELENIEAE)

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ABSTRACT

Schkuhria pinnata is treated as having two varieties, one in South America (var. *pinnata*), and one in North America (var. ***wislizeni*** [A. Gray] B.L. Turner, *comb. nov.*). A complete synonymy for the North American elements of *S. pinnata* is given, along with a map showing their distribution.

KEY WORDS: Asteraceae, Helenieae, *Schkuhria,* systematics

Schkuhria is a weedy genus of about five species. One of these, *S. pinnata* (Lam.) Kuntze *ex* Thell., is a widespread highly variable weedy species of North and South America, which has received varying taxonomic treatments. The species is typified by elements from South America and plants from that continent, if treated as a single infraspecific taxon, are properly called var. *pinnata*. The North American elements of *S. pinnata* have received numerous treatments and epithets, and these are largely accounted for by Rydberg (1914), Heiser (1945), Blake (1951) and McVaugh (1984). McVaugh, in particular, has presented a masterful account of *S. pinnata* in his treatment for the flora of Novo-Galiciana, recognizing two varieties, as follows:

1. Involucral bracts mostly dark red or purplish throughout (rarely not); hairs on angles of achenes 0.6-1.8 mm long. .... var. *guatemalensis*
1. Involucral bracts mostly green (sometimes the upper 1/3 reddish); hairs on angles of achenes 0.3-0.6 mm long. .... var. *virgata*

For the reasons given below, I can recognize but a single varietal taxon of *Schkuhria pinnata* in North America, this being ***Schkuhria pinnata*** (Lam.) Kuntze *ex* Thell. var. ***wislizeni*** (A. Gray) B.L. Turner, *comb. nov.*, based upon *Schkuhria wislizeni* A. Gray, Mem. Amer. Acad. Sci. 4:96. 1849. The purpose of the present paper, then, is to account for the synonymy of the two varieties recognized by McVaugh, and to justify the synonymizations of all of the formal infraspecific epithets of North America with the earliest available varietal epithet, var. *wislizeni*.

SCHKUHRIA PINNATA (Lam.) Kuntze *ex* Thell., Repert. Sp. Nov. 11:308. 1912.

SCHKUHRIA PINNATA (Lam.) Kuntze *ex* Thell. var. *GUATEMALENSIS* (Rydb.) McVaugh, Contr. Univ. Michigan Herb. 9:443. 1972.
Hopkirkia anthemoidea DC.
Schkuhria anthemoidea (DC.) Coult. var. *guatemalensis* (Rydb.) Heiser
Schkuhria anthemoidea (DC.) Coult. var. *wrightii* (A. Gray) Heiser
Schkuhria guatemalensis (Rydb.) Standl. & Steyerm.
Schkuhria hopkirkia A. Gray
Schkuhria pinnata (Lam.) Kuntze *ex* Thell. var. *guatemalensis* (Rydb.) McVaugh
Schkuhria wislizeni A. Gray var. *wrightii* (A. Gray) S.F. Blake
Schkuhria wrightii A. Gray
Tetracarpum guatemalense Rydb.
Tetracarpum wrightii (A. Gray) Rydb.

SCHKUHRIA PINNATA (Lam.) Kuntze *ex* Thell. var. *VIRGATA* (Llave) Heiser, Ann. Missouri Bot. Gard. 32:271. 1945.
Mieria virgata Llave
Schkuhria anthemoidea (DC.) Coult. var. *wislizeni* (A. Gray) Heiser
Schkuhria anthemoidea (DC.) Coult. var. *wislizeni* f. *flava* (Rydb.) Heiser
Schkuhria pringlei S. Wats.
Schkuhria pinnata (Lam.) Kuntze *ex* Thell. var. *virgata* f. *pringlei* (S. Wats.) Heiser
Schkuhria virgata (Llave) DC.
Schkuhria wislizeni A. Gray
Schkuhria wislizeni A. Gray forma *flava* (Rydb.) S.F. Blake
Schkuhria wislizeni A. Gray var. *frustrata* S.F. Blake
Tetracarpum anthemoideum (DC.) Rydb.
Tetracarpum flavum Rydb.
Tetracarpum pringlei (S. Wats.) Rydb.
Tetracarpum wislizeni (A. Gray) Rydb.

As shown in Figure 1, when mapped (mostly using achenal pubescence, *cf.* Figure 2), the two taxa recognized by McVaugh have essentially identical distributions. Indeed, varying intermediates between the two extremes occur (so annotated at LL, TEX) and occasional specimens will have typical forms of each mounted upon the same sheet, suggesting that all of these represent but a single variable species. McVaugh (1984) also commented upon this phenomenon noting that in Nueva Galicia these two extremes "are scarcely separable but seem to have somewhat different habitat-preferences and different geographical extremes. They were maintained as different species by Rydberg (1914) and Heiser (1945) but the characters by which they are separated vary and recombine so capriciously that it may be unrealistic to maintain them at the level of varieties." However, I was unable to document the existence of habitat preferences for the two forms, nor could I infer any difference in their geographical extremes in North America as shown in Figure 2, consequently I have no hesitancy in treating these as but variable elements of a wide-ranging polymorphic species, as McVaugh suspected might be the case.

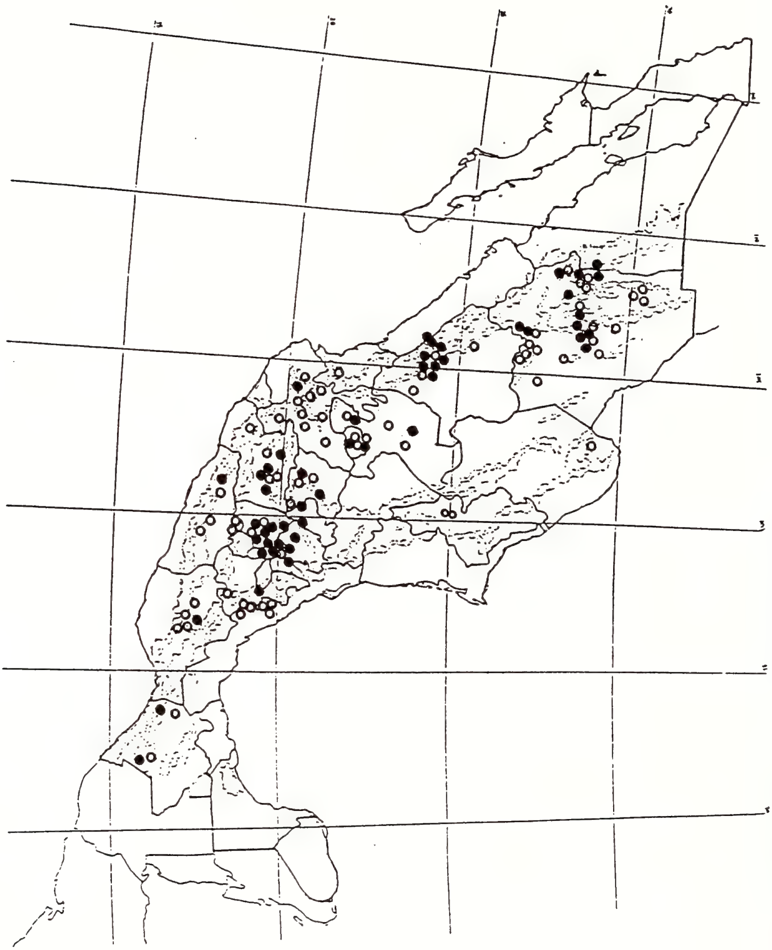

Figure 1. Distribution of achenal forms or "varieties" of *Schkuhria pinnata* (sensu McVaugh 1984) in México: var. *guatemalensis* (open circles) and var. *virgata* (closed circles). Numerous intermediates are treated as one or the other, according to length of the achenal hairs as given in McVaugh's key.

Figure 2. Head and floret variation in *Schkuhria pinnata* var. *wislizeni*. Upper row, left to right, head, achene ray floret, disk floret, style branches of disk floret (*Pringle 13566* [LL]); middle row (*Ellison 20* [TEX]); lower row (with ray florets absent, *Pringle 13567* [TEX]).

The North American populations and or individuals of *Schkuhria pinnata* are very similar to those of South America, but can be readily distinguished from the latter by possessing mostly shorter elliptic-ovate ligules (0.5-1.0[-3.0] mm long, vs. linear and 2.0-4.0 mm long) and achenes with mostly very pubescent angles (vs. weakly pubescent to nearly glabrous). If a single varietal name is to be applied to the North American elements the correct name must be *S. pinnata* var. *wislizeni* (A. Gray) B.L. Turner, as noted above. Heiser (1945) treated all of the North American infraspecific categories which he recognized as belonging to *S. anthemoidea*, this based upon an inadequate interpretation of the type of the latter, as noted by Blake (1951).

Schkuhria pinnata var. *pinnata*, so far as known, is confined to South America, but the occasional waif or garden weed of var. *pinnata* has been collected in the northeastern U.S.A. (*e.g.*, Milton, Mass., *Kidder s.n.* [LL]). The var. *wislizeni* is confined to North America, so far as known.

The present study is based upon a large suite of collections at LL., TEX (200+ sheets), all of these appropriately annotated, both as to variety and forma.

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A NEW SPECIES OF *VIGUIERA* (SUBGENUS *AMPHILEPIS*) FROM MEXICO, WITH OBSERVATIONS ON ITS RELATIONSHIP TO THE GENUS *TITHONIA* (ASTERACEAE)

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ABSTRACT

A new species, ***Viguiera ayutlana*** B.L. Turner, is described from Jalisco, México. It apparently belongs to the subgenus *Amphilepis* of *Viguiera* but shares one or more characters with the genus *Tithonia*, suggesting that these two taxa are very closely related, if not the same.

KEY WORDS: Asteraceae, Heliantheae, *Viguiera*, *Tithonia*, México, systematics

Preparation of a treatment of the Heliantheae of México has occasioned the present paper.

VIGUIERA AYUTLANA B.L. Turner, *spec. nov.* TYPE: MEXICO. Jalisco: "Roadsides at edge of cornfield in fir forest area about 28 road miles west of Ayutla, and about 70 miles northwest of Autlan", ca. 6700 ft, 3 Nov 1962, *A. Cronquist 9791* (HOLOTYPE: TEX!).

Similis *V. excelsae* (*V. excelsa*) (Willd.) Benth. & Hook., sed pedunculis valde fistulosis tantum sub capitulis et receptaculis valde conicis (vice receptaculorum convexorum).

Shrub ca. 2 m high. Stems purplish, moderately to sparsely hirsute with bent hairs 0.8-1.5 mm long. Leaves alternate, those on primary stems mostly 15-30 cm long, 4.5-12.0 cm wide; petioles 1.5-4.0 cm long, gradually tapering upon the blades; blades ovate to ovate-elliptic, moderately pubescent above and below, the lower surfaces prominently 3-nervate somewhat above the base, the margins crenate. Heads mostly single and axillary along the upper stems, 6-8 cm across the extended rays. Peduncles 4-14 cm long, markedly swollen and fistulose just below the heads. Involucres hemispheric, 12-14 mm high, ca. 30 mm wide (pressed), the bracts 3-4 seriate, graduate, broadly ovate to broadly elliptic, the inner series loose and somewhat

Figure 1. *Viguiera ayutlana*, from holotype.

scarious with broadly rounded apices, the margins weakly ciliate. Receptacle conical, 3-4 mm high, 2-3 mm across; bracts linear-oblanceolate, shorter than the subtended florets, their apices cuspidate. Ray florets 13-18, neuter, sterile; ligules yellow 25-32 mm long, 5-9 mm wide, 16-21 nervate, the apices inconspicuously 2-3 lobed. Disk florets numerous, perfect, fertile; corollas yellow, ca. 4 mm long; tube ca. 1 mm long; limb ca. 3 mm long, markedly pubescent at its base, the lobes ca. 0.8 mm long. Anthers black, the apices ovate. Style branches flat, their apices ovate, glabrous. Achenes radially compressed, ca. 3 mm long, 1.3 mm wide, black, the pappus of 2 lateral awns 1-2 mm long, between these 4-6 fimbriate scales ca. 1 mm long.

Cronquist, who collected type material, identified this taxon as "*Viguiera* aff. *excelsa* (Willd.) Benth. & Hook.", which it superficially resembles. Upon first examining the holotype (in 1987) I annotated this as a possible hybrid between *Viguiera hypochlora* S.F. Blake and some species of *Tithonia*. La Duke (by annotation, 1980), having examined this in connection with his treatment of *Tithonia*, took the plant to be an "unusual" collection of *V. excelsa*. It is an enigmatic collection, for it has enlarged fistulose peduncles like those of *Tithonia*; achenes with a pappus like those of *Viguiera*; receptacular bracts like *Tithonia*; but a markedly conical receptacle, unlike either of the two genera. In the former characters it more or less bridges the gap between *Tithonia* and subgenus *Amphilepis* of *Viguiera* and almost certainly argues for a close relationship of these two taxa. In this connection it must be noted that John Strother recently called to my attention that *Viguiera subcanescens* S.F. Blake of the subgenus *Amphilepis* is almost certainly a synonym of *Tithonia longiradiata* (Bertol.) S.F. Blake, this not accounted for by La Duke in his revisionary study. Finally, there is a remarkable resemblance of the leaves, achenes, and corolla of the latter with *Viguiera ayutlana* (*cf.* Figures 52-54 in La Duke 1982); no doubt the presence of a viguieroid pappus keeps the latter out of *Tithonia*.

Viguiera (s.l.) is in much need of detailed DNA study and I surmise that it will have to ultimately include *Tithonia*, unless drastic generic splintering of the complex is preferred, in which case it is still likely that *Amphilepis* will reside within, or next to, *Tithonia*.

ACKNOWLEDGMENTS

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REDISCOVERY OF *SOLANUM INCOMPLETUM* DUNAL (SOLANACEAE) ON THE U.S. ARMY'S POHAKULOA TRAINING AREA, HAWAII

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ABSTRACT

A federally endangered plant species, *Solanum incompletum* Dunal, was "rediscovered" on the U.S.–Army's Pohakuloa Training Area, Hawaii. On 19 January 1996, nine adults and two seedlings of *S. incompletum* were found growing in a *Myoporus sandwicense* A. Gray dominated shrubland at an elevation of approximately 1425 m. Consumption by feral ungulates (sheep and/or goats) is the major threat to the continued existence of this population, and each adult plant had been severely browsed. The location of the population on a nearly inaccessible margin of the installation makes impact by military activities highly unlikely.

KEY WORDS: *Solanum*, Hawaii, endangered species, extinction

The U.S. Army's Pohakuloa Training Area (PTA) (Figure 1) is a 44,100 ha installation located in the saddle region between Mauna Kea and Mauna Loa on the island of Hawaii. Approximately one-half of the installation is ordnance impact area, and the remaining lands are used for maneuver training by the Army's 25th Infantry Division (Light), Marine's 1st Expeditionary Brigade, National Guard, Army Reserves, and occasionally by allied troops. Shaw *et al.* (1990) reported that approximately 4% of the installation outside of the impact area has been disturbed by military training. Most of the installation has not been impacted by military activities because rugged terrain makes much of the area inaccessible. Major disturbances which result in greatly reduced vegetative ground cover are typically limited to undeveloped roads, frequently used bivouac sites, and fixed artillery firing points.

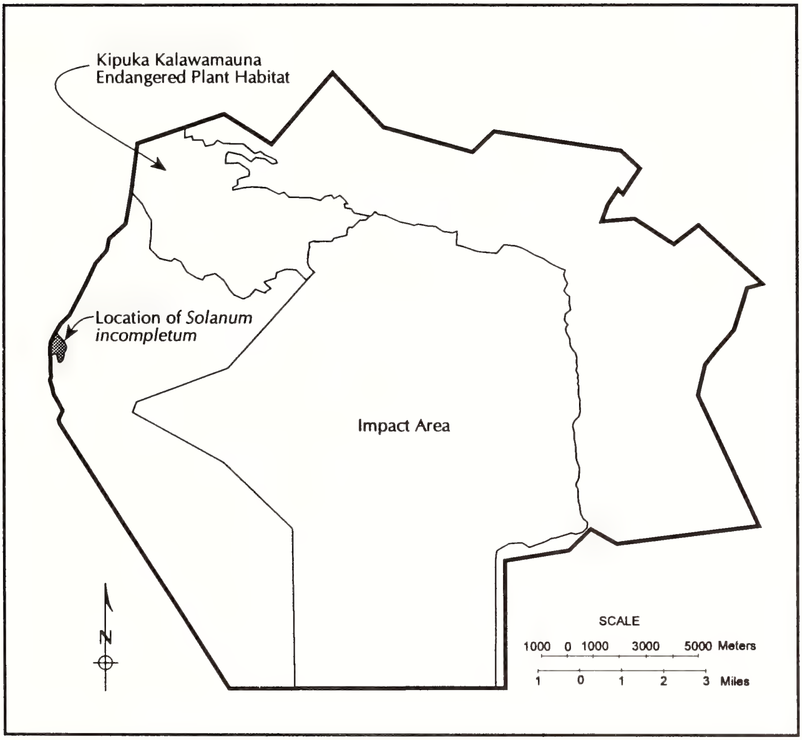

Figure 1. U.S. Army's Pohakuloa Training Area, Hawaii, Hawaii with large ordnance impact area, endangered plants habitat, and location of "rediscovery" site of *Solanum incompletum* Dunal.

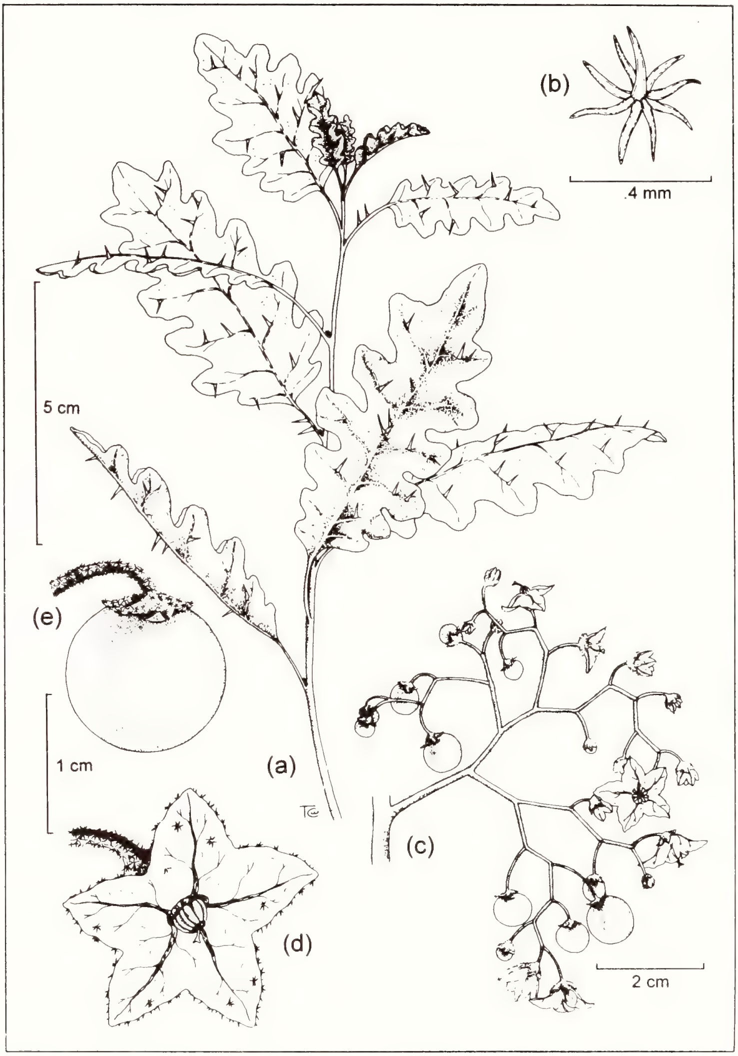

Figure 2. Line drawing of *Solanum incompletum* Dunal. a. habit, b. stellate hair, c. inflorescence, d. flower, e. fruit [(a & b from *C.N. Forbes ns*, Kona, Hawaii, 23 June 1923 (BISH); c & e from *J.F. Rock ns*, Puu Ikaaka, Hawaii, Feb 1912 (BISH), d from *G.C. Munro ns*, Kaiholena, Lanai, 30 March 1919 (BISH)].

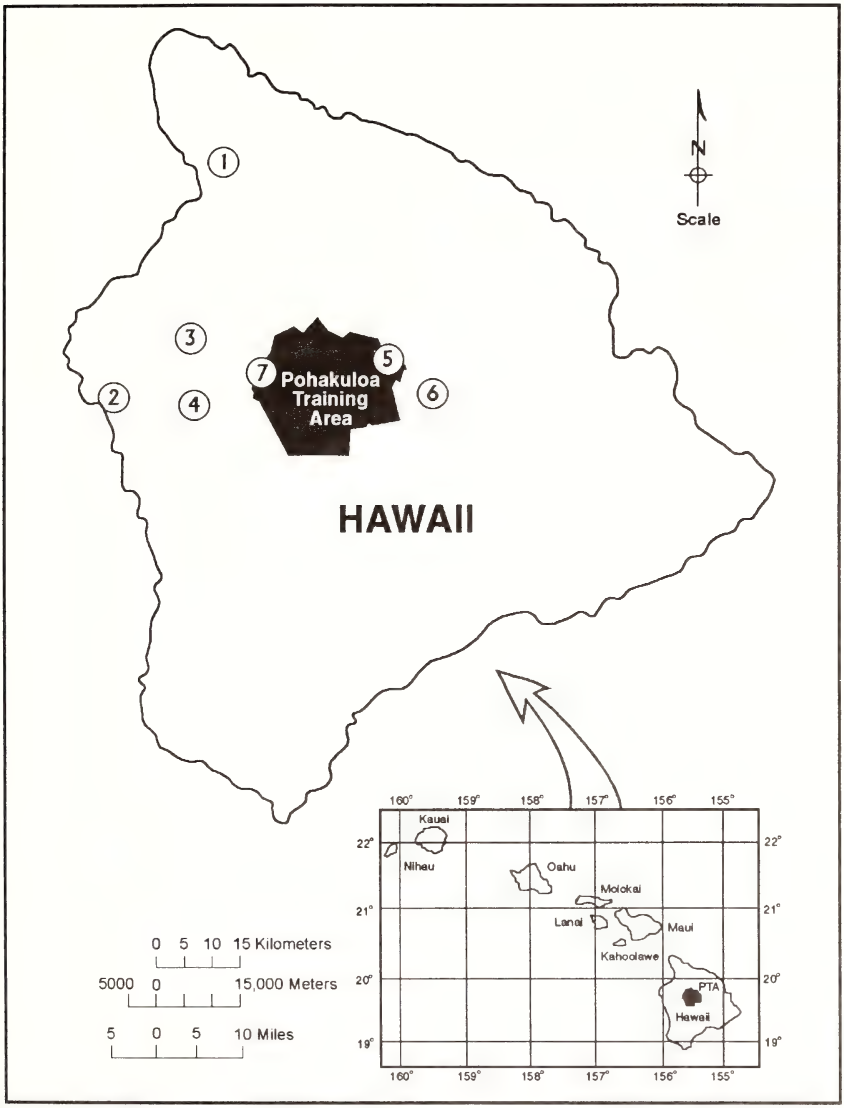

Figure 3. Reported locations of *Solanum incompletum* Dunal. on the island of Hawaii: (1) Kawaihae, (2) Kona, (3) Puu Waawaa, (4) Puu Ikaaka, (5) Puu Omaokaii, (6) Puu Huluhulu and (7) new site at Pohakuloa Training Area.

Figure 4. Photograph of *Solanum incompletum* Dunal in vegetative stage on the U.S. Army's Pohakuloa Training Area, Hawaii, Hawaii.

Figure 5. Photograph of *Myoporum* shrubland on approximately 5000 year old Mauna Loa Pahoehoe lava flow which is typical of the area where *Solanum incompletum* was found on the U.S. Army's Pohakuloa Training Area, Hawaii, Hawaii.

Castillo *et al.* (1995) described and mapped 24 plant communities on the installation and identified four major associations. First, barren lava and disturbed areas with little or no ground cover compose about 12,475 ha. Second, treelands dominated by *Metrosideros polymorpha* Gaud., *Chamaesyce olowaluana* (Sherff) Croizat & Degener, and *Myoporum sandwicense* A. Gray constitute nearly 14,300 ha of the installation. Third, shrublands comprise 15,700 ha and have the greatest diversity of communities. Dominant shrubs are *Myoporum sandwicense, Sophora chrysophylla* (Salisb.) Seem., *Styphelia tameiameiae* (Cham. & Schlechtend.) F.v. Muell., *Dodonaea viscosa* Jacq., and *Chenopodium oahuense* (Meyen) Aellen. Fourth, native (*Eragrostis atropioides* Hillebr.) and introduced [*Pennisetum setaceum* (Forssk.) Chiov.] grasslands make up the remaining 1625 ha. Some of the largest relatively undisturbed, dry montane treelands, shrublands, and grasslands found on the island of Hawaii occur in the saddle region including PTA (Gagne & Cuddihy 1990; Tierney *et al.* 1996).

Shaw & Douglas (1996) listed over 250 taxa from 70 families and 175 genera of vascular plants from the installation. As floristic surveys and vegetative studies continue, species not previously reported from the installation are continually collected, verified, and added to the species list. Numerous rare plant species have been reported from the installation. Federally listed endangered species verified from the installation are: *Asplenium fragile* C. Presl. var. *insulare* Morton (Bruegmann *et al.* 1994), *Haplostachys haplostachya* (A. Gray) St. John (Herbst & Fay 1979), *Hedyotis coriacea* Sm. (Herbst *et al.* 1992a), *Portulaca sclerocarpa* A. Gray (Mehrhoff 1994), *Silene lanceolata* A. Gray (Herbst *et al.* 1992b), *Spermolepis hawaiiensis* Wolff (Canfield *et al.* 1994; J. Lau, pers. comm.), *Stenogyne angustifolia* A. Gray (Herbst & Fay 1979), *Tetramolopium arenarium* (A. Gray) Hillebr. (Douglas *et al.* 1989; Mehrhoff 1994), and *Zanthoxylum hawaiiense* Hillebr. (Mehrhoff 1994). The Kipuka Kalawamauna endangered plants habitat area (Figure 1) was cooperatively designated by the U.S. Army, U.S. Fish & Wildlife Service, and State of Hawaii Division of Land and Natural Resources primarily for the protection of the first two endangered species found on PTA (*H. haplostachya* and *S. angustifolia*). One federally listed threatened species, *Silene hawaiiensis* Sherff (Mehrhoff 1994), occurs on PTA. *Neraudia ovata* recently was verified from the installation and has been proposed as an endangered species (Bruegmann 1995). The following taxa from PTA are considered species of special concern: *Chamaesyce olowaluana, Eragrostis deflexa* Hitchc., *Exocarpos gaudichaudii* A. DC, *Festuca hawaiiensis* Hitchc., *Hesperocnide sandwicensis* (Wedd.) Wedd., *Portulaca villosa* Cham., *Tetramolopium consanguineum* (A. Gray) Hillebr., and *T. humile* (A. Gray) Sherff subsp. *humile* var. *sublaeve* Sherff. Specimens from PTA once reported as *T. lepidotum* (Less.) Sherff are being described as a new species (T. Lowrey, pers. comm.).

The purposes of this paper are to: (1) report the "rediscovery" of the endangered species *Solanum incompletum* Dunal (Canfield *et al.* 1994), (2) document its occurrence on PTA and (3) delineate current and/or potential threats to this endangered species.

Solanum incompletum is reported to be a shrub to 3 m in height (Symon 1990). In the PTA populations, the plant appears to be suckering from the base after being browsed by feral ungulates; thus, it appears suffrutescent and only slightly woody. St. John (1969) also reported that *S. incompletum* suckers and has strong vegetative shoots. There are a few dead stems 5 to 7 dm in height remaining on a single

individual. The plants are armed with stout reddish prickles nearly 5 mm in length, and they occur on both surfaces of the leaves and on the stem (at least on new growth) (Figure 2). The leaves are simple, alternate, and elliptical with variously lobed margins. In the plants at PTA, prickles occur on the petioles, mid-rib and prominent lateral veins on both leaf surfaces. Leaf venation, particularly on the undersurface, is prominent. Also, new growth is pubescent with prominent yellowish stellate hairs. Symon (1990) reported, and examination of herbarium material shows, that the species has perfect, regular-shaped flowers borne in simple to compound cymes. None of the plants we observed in the field were in flower or fruit. Symon (1990) described the fruit as a berry which probably is yellow and ripens to black. He suggested that the fruit may not be produced often and that plants and/or flowers may be self-incompatible. We observed, however, young seedlings with long linear cotyledons germinating in proximity to adult plants.

Hillebrand (1888) distinguished two varieties. *Solanum incompletum* var. *mauiense* Hillebr. was segregated based on larger leaves, while *S. i.* var. *glabratum* Hillebr. was separated because the mature leaves were glabrate. Also, St. John (1969) named a separate but related species (*S. haleakalaense* St. John) from Maui based on leaf shape and abundance of prickles. In the latest treatment of the Solanaceae of Hawaii, however, Symon (1990) placed *S. haleakalaense* in synonymy and did not recognize any subspecific taxa because of incomplete collections and taxonomic difficulties with the genus (Canfield *et al.* 1994).

Solanum incompletum was first collected on Hawaii by Nelson in 1779 and has subsequently been found on Kauai, Molokai, Lanai, and Maui (St. John 1978; Symon 1990). On the island of Hawaii, the species was known from Kohala Mountains, Kona, Puu Waawaa, Puu Ikaaka, Puu Omaokoili (on PTA), and Puu Huluhulu (Canfield *et al.* 1994) (Figure 3). The last reported sighting of this species was from Puu Huluhulu where two individuals were found forty-five years ago growing at 2040 m in an *Acacia koa* A. Gray and *Sophora chrysophylla* mesic forest (Canfield *et al.* 1994). The PTA locations lie between Puu Waawaa and Puu Omaokoili/Puu Huluhulu (Figure 3). Symon (1990) described the elevational range of *S. incompletum* from 300 m to 2040 m. Historical habitats varied from dry mesic forest to diverse mesic forest and finally to subalpine forests.

Solanum incompletum was “rediscovered” on PTA on 19 January 1996 by Close & Schnell. Nine adult individuals are growing at the base of several *Myoporum sandwicense* shrubs. The *S. incompletum* plants have from one to three stems per individual, but when first seen were only 3 dm or less in height because of browsing by feral sheep and goats. As previously mentioned, the plants appear much more herbaceous than shrubby (Figure 4). Also, two germinating seedlings, identified by the characteristic red prickles, are establishing under *M. sandwicense* and indicate that viable seeds must have been produced at some time.

The *Solanum incompletum* individuals occur in a kipuka (*i.e.*, older usually vegetated flow surrounded by younger less vegetated flows forming pockets or islands of vegetation) which supports a *Myoporum* shrubland at an elevation of approximately 1425 m (Figure 5). The shrubland is on a relatively old [5000 years before present (ybp)] Mauna Loa pahoehoe lava flow which subsequently was surrounded by younger Mauna Loa aa flows (4200 ybp). Multi- or occasionally single-stemmed *Myoporum sandwicense* shrubs averaging about 3 m in height dominate the site.

Other woody species in the immediate area are *Myrsine lanaiensis* Hillebr. and *Sophora chrysophylla*. The understory is dominated by "weedy" alien species and indicative of areas over utilized by feral ungulates. Numerous trails, animal droppings, wool or hair entangled in branches, and bones from dead animals all indicate heavy use of the area by feral sheep and goats. Associated understory species include *Solanum pseudocapsicum* L., *Marrubium vulgare* L., *Pennisetum setaceum*, *Asclepias physocarpa* (E. Meyer) Schlecter, and *Kalanchoe tubiflora* (Harv.) Raym.-Hamet.

Canfield *et al.* (1994) discussed threats to *Solanum incompletum* at the time it was listed as endangered. They indicated that the major threats were: (1) reduced number of individuals and populations which increases the potential for extinction from stochastic events; (2) correlated with the first threat is over-utilization for commercial, recreational, scientific, or educational purposes because of low numbers; and (3) competition from the alien plant species *Senecio mikanioides* Otto *ex* Walp. at Puu Huluhulu. They did not indicate that feral animals were a threat because the only known extant population at the time of listing was already fenced to protect the area.

On PTA browsing by feral animals represents an immediate threat to the continued existence of the species at this location. Although the plant is covered with prickles, feral sheep and/or goats appear to relish it. The area in which the population occurs should be immediately fenced to protect the species; or at the very least, individual plants should be caged in order to allow them to flower and potentially produce viable seeds for propagation. Threats to *Solanum incompletum* by military training at PTA are almost non-existent. Accessibility to the area is very difficult and easily controlled. There are no roads within the area, thus dust from military vehicles does not represent a threat. The possibility of accidental fire from military ordnance, obscurants, etc. is remote because the species occurs approximately 5 km from the nearest boundary of the ordnance impact area.

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NOTULAE DE RANUNCULACEIS SINENSIBUS (XX)

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ABSTRACT

Delphinium pseudoyunnanense W.T. Wang & M.J. Warnock, ***D. kansuense*** W.T. Wang var. ***villosiusculum*** W.T. Wang & M.J. Warnock, and ***Thalictrum simaoense*** W.T. Wang & G. Zhu are described as new. New combinations are provided for ***Delphinium shawurense*** W.T. Wang var. ***pseudoaemulans*** (C.Y. Yang & B. Wang) W.T. Wang, ***D. delavayi*** Franch. var. ***baoshanense*** (W.T. Wang) W.T. Wang, ***D. umbrosum*** Hand.-Mazz. var. ***drepanocentrum*** (Bruhl) W.T. Wang & M.J. Warnock, ***Batrachium trichophyllum*** (Chaix *ex* Villars) Bosche var. ***jingpoense*** (G.Y. Chang *et al.*) W.T. Wang, and ***Ranunculus*** sect. ***Stenoglossa*** (W.T. Wang) W.T. Wang. These new taxa and new combinations are necessary to facilitate ongoing study of the Flora of China.

KEY WORDS: Ranunculaceae, *Batrachium, Delphinium, Ranunculus, Thalictrum*, China, systematics, flora

The following new taxa and new combinations have been brought to light by ongoing work on the Flora of China.

Delphinium pseudoyunnanense W.T. Wang et M.J. Warnock, *spec. nov.* TYPE: CHINA. Yunnan : Between Tengchong and Longling

(龙陵), on banks of road, common only beyond Nan Kao Chai, fl. pale lavender purple, 15 Sep 1922, *J.F. Rock 6551* (HOLOTYPE: GH).
Delphinium yunnanense auct non (Franch.) Franch.: Munz, J. Arnold Arb. 48:543. 1967, p.m.p., quoad *Rock 6551.*

Herba perennis. Caulis 1.5 m? altus, parte inferna ignota, superne glaber, ramosus. Folia caulina superna longuiscule vel breviter petiolata; laminae tenuiter coriaceae, ambitu pentagonae, ca. 7.5 cm longae et latae, basi cordatae, 3-sectae, segmento centrali lanceolato-lineari ca. 6.5 mm lato apice attenuato, segmentis lateralibus inaequaliter 2-partitis, lobis lanceolato-linearibus vel anguste lanceolatis, vel indivisae, lanceolato-lineares, ca. 6 cm longae, 6 mm latae, supra prope marginem sparse adpresseque puberulae, subtus sparse crispule adpresseque puberulae; petioli 1.4-7.8 cm longi, glabri, basi paullo dilatati, haud vaginati. Racemi axillares et terminales, 25-45 cm longi, densiuscule 18-30-flori; rhaches cum pedicellis glabrae; bracteae anguste lanceolato-lineares, vel subulatae, 6-23 mm longae, 0.8-1.8 mm latae, sparse puberulae; pedicelli 0.25-30 cm longi, superne 2-bracteolatae; bracteolae anguste lanceolato-lineares, 5-9 mm longae, 0.8-1 mm latae, utrinque sparse adpresseque puberulae, margine ciliolatae. Sepala purpurea, extus dense adpresseque puberula, intus glabra, superum elliptico-obovatum, 11-14 mm longum, 6-8 mm latum, calcare sepalino subulato 13-15 mm longo recto basi 1.8-2.2 mm crasso, cetera oblonga, 10-12 mm longa, 3.5-6.0 mm lata. Petala apice 2-lobata, ciliata. Staminodia ca. 9.6 mm longa, unguibus ca. 4 mm longis sparse puberulis basi breviter appendiculatis, limbis suboblongis ca. 4.6 mm longis 3.2 mm latis prope medium 2-fidis margine longe ciliatis ventre supra basin dense luteo-barbatis. Stamina ca. 4 mm longa, filamentis plerumque margine sparse pilosis. Carpella 3, ovariis ca. 2.2 mm longis apice sparse puberulis, stylis ca. 1.5 mm longis basi sparse puberulis. Folliculi anguste oblongi, 12-16 mm longi, 2.5-3.5 mm lati, subglabri, stylis persistentibus 2.5-3.0 mm longis. Semina brunnea, tetrahedralia, ca. 1.2 mm longa, ad angulos anguste alata.

Affine *D. yunnanense* (Franch.) Franch., quod racemis laxe 3-10-floris, pedicellis usque ad 8.5 cm longis, floribus majoribus, calcaribus sepalinis 17-24 mm longis, petalis apice emarginatis glabris, filamentis plerumque glabris, ovariis saepe dense puberulis.

This new species is closely related to *Delphinium yunnanense* (Franch.) Franch., differing from that species in racemes elongate, densely 25-45-flowered, pedicels shorter, 0.25-30 cm long, flowers smaller, with sepaline spurs 13-15 mm long, petals ciliate and 2-lobed, filaments mostly pilose at upper margin, and ovaries sparsely puberulous only near apex. In *D. yunnanense*, the racemes are laxly 3-10-flowered, pedicels are up to 8.5 cm long, the flowers are larger, with sepaline spurs 17-24 mm long, the petals are glabrous, emarginate at apex, the filaments are mostly glabrous, and the ovaries are usually densely puberulous.

Delphinium kansuense W.T. Wang var. ***villosiusculum*** W.T. Wang et M.J. Warnock, *var. nov.* TYPE: CHINA. Qinghai (青海) : the reaches of Datong River (大通河流域), between Tien Tang Ssu and Shan Shin Ming (三十名), alt. 3000 m, Sept. 15, 1915, *Farrer & Purdom 800* (HOLOTYPE: MO).

A *D. kansuensi* W.T. Wang var. *kansuensi* differt racemi rachide pedicellisque pilis mollibus plus minusve patentibus tectis, bracteis bracteolisque dorso sparse puberulis.

This new variety differs from the typical variety in the raceme rachis and pedicels densely covered with spreading soft hairs, and in the bracts and bracteoles abaxially covered with sparse hairs. In the typical variety, the raceme rachis and pedicels are densely covered with appressed short hairs, and the bracts and bracteoles are also abaxially densely covered with appressed short hairs.

The locality of Kansu(甘肃)indicated on the type of this new variety is erroneous (Farrer 1926, pp. 138-237). The typical variety is restricted to the mountainous region of Central Gansu Province and the ranges of the two varieties are separated by approximately 250 km.

Delphinium shawurense W.T. Wang var. ***pseudoaemulans*** (C.Y. Yang et B. Wang) W.T. Wang, *stat. et comb. nov.* BASIONYM: *Delphinium pseudoaemulans* C.Y. Yang et B. Wang, Acta Phytotax. Sin. 30:86. 1992.

Delphinium shawurense W.T. Wang, characterized by its leaf lobes being long acuminate or caudate at apex, has two varieties, var. *shawurense* and var. *albiflorum* C.Y. Yang et B. Wang, both restricted to Mt. Shawur, Hoboksar County, Xinjiang Autonomous Region and both with stems mostly glabrous and hispidulous only near the base. The two varieties differ from each other in indumentum of the raceme and in color of sepals. *Delphinium pseudoaemulans* C.Y. Yang et B. Wang is also endemic to Mt. Shawur and its leaves are similar to *D. shawurense*, distinguished from the latter only by its stems being hispid below and sparsely puberulous above, and is better treated as a variety of *D. shawurense.*

Delphinium delavayi Franch. var. ***baoshanense*** (W.T. Wang) W.T. Wang, *stat. et comb. nov.* BASIONYM: *Delphinium baoshanense* W.T. Wang, Bull Bot. Res. Harbin 69(1):12.1989.

Delphinium baoshanense, restricted to Baoshan County of western Yunnan Province, is closely related to *D. delavayi,* differing only in its much more strongly divided leaves, and in raceme rachis and pedicels covered with only white appressed hairs. The raceme rachis and pedicels of *D. delavayi* are covered with both white appressed hairs and yellow spreading glandular hairs. Heretofore, *D. delavayi* comprised three varieties. The typical variety is widely distributed on the Yunnan Plateau, neighboring western Guizhou Province, and southwestern Sichuan Province, and in the northern part of its range occur the two other varieties, var. *pogonanthum* (Hand.-Mazz.) W.T. Wang and var. *lasiandrum* W.T. Wang. Geographically, *D. baoshanense* appears to be a variant marking the western edge of the geographic distribution of *D. delavayi.*

Delphinium umbrosum Hand.-Mazz. var. ***drepanocentrum*** (Bruhl) W.T. Wang et M.J. Warnock, *comb. nov.* BASIONYM: *Delphinium altissimum* Wall. var.

drepanocentrum Bruhl *ex* Huth, Bot. Jahrb. Syst. 20:419. 1895. *Delphinium altissimum* Wall. subsp. *drepanocentrum* Bruhl, Ann. Bot. Gard. Calc. 5:101. 1896. *Delphinium altissimum* Wall. subsp. *drepanocentrum* (Bruhl) Chowdhury *ex* Mukerjee, Bull Bot. Surv. India 2:293-295. 1961.; W.T. Wang, *Fl. Reipubl. Pop. Sin.* 27:402. 1979. *Delphinium drepanocentrum* (Bruhl) Munz, J. Arnold Arb. 49:94, fig. 13, L. 1968; Tamura, Acta Phytotax. Geobot. 23:100. 1968.

This new combination is necessitated by the editorial policy of the Flora of China Project to recognize only one infraspecific rank within a genus. Use of variety as the infrageneric rank for the Chinese *Delphinium* requires fewer new combinations than use of subspecies.

Thalictrum simaoense W.T. Wang et G. Zhu, *spec. nov.* TYPE: CHINA. Yunnan(云南): mountain west of Simao(思茅), alt. 2000 m, on cliff, *A. Henry 13096* (HOLOTYPE: MO; Isotype: NY). Figure 1.

Herba perennis, tota glabra. Caules aliqui caespitosi, graciles, 9-15 cm alti, 0.5-0.7 mm diam., supra basin vel prope medium dichotome ramosi. Folia basalia 7.0-12.8 cm longa, longe vel longiuscule petiolata, bi-ternata; laminae 5-9 cm longae, 6.2-8.0 cm latae; foliola tenuiter papyracea, orbiculari-ovata, reniformia, vel suboblata, 0.9-1.8 cm longa, 1.0-2.8 cm lata, basi profunde cordata vel subcordata, apice rotundata vel subtruncata, margine inconspicue 3-5-lobulata, pauce rotundato-dentata, nervis supra indistincte prominulis subtus prominentibus retem conspicuum formantibus; petioli graciles, 1.8-3.8 cm longi; stipulae brunneae, membranaceae, lineares, ca. 2.5 mm longae. Folia caulina 1-2, foliis basalibus simila, sed saepe minora, 1.5-6.5 cm longa, 1.5-3.4 cm lata, foliolis plerumque oblatis 0.4-1.0 cm longis 0.45-1.20 cm latis basi subcordatis indistincte 3-lobulatis, lobis margine integris, petiolis 0.2-3.0 cm longis, stipulis ca. 1 mm longis margine laceratis. Monochasia terminalia, 2(-3)-flora; bracteae breviter petiolatae, ternatae, ca. 7 mm longae, foliolis late rhombicis indistincte 3-lobulatis, vel subsessiles, simplices, ellipticae vel ovatae, 2-4 mm longae; pedicelli capillares, 1.7-2.2 cm longi. Flos ca. 1 cm diam. Sepala 4, alba, late elliptica vel elliptica, 4.2-5.0 mm longa, 3.0-3.5 lata, apice rotundata vel obtusa. Stamina 9-15, 3.5-4.0 mm longa, filamentis filiformibus 2.2-3.0 mm longis apicem versus paulo incrassatis, antheris oblongis 1.0-1.2 mm longis apice indistincte breviterque apiculatis. Carpella 10-13, sessila, ca. 2.8 mm longa, ovariis fusiformibus ca. 1.4 mm longis, stylis ovariis subaequilongis subulatis apice hamatis vel circianatis et ventre indistincte stigmaticis. Achenia non satis matura bilateraliter compressa, complanata, sessilia, fusiformia, ca. 1.9 mm longa, 0.5 mm lata, utringue tenuiter 3-costata, stylis persistentibus ca. 1.2 mm longis apice hamato-curvatis.

Affine *Thalictro rostellato* Hook. *f.* et Thoms., quod follis dorso pedicellisque minute puberulis, antheris apice obtusis haud apiculatis, carpellis paucioribus 4-7 carpophoris instructis recedit.

Figure 1. *Thalictrum simaoense* W.T. Wang et G. Zhu, *spec. nov.* (*A. Henry 13096*). A. habit; B. flower; C. flower details showing gynoecium and the filiform filaments of stamens.

With more or less filiform filaments and elongate hooked styles, this new species is related to *Thalictrum rostellatum* Hook. *f.* & Thoms., and is distinguished from that species by the entirely glabrous plant, the shortly apiculate anthers, and the flower with more (10-13) carpels which lack carpophores. In *T. rostellatum*, the leaves abaxially and pedicels are minutely puberulous, the anthers are obtuse at apex, and the flower has 4-7 carpels with carpophores at base.

Batrachium trichophyllum (Chaix *ex* Villars) Bosche var. ***jingpoense*** (G.Y. Chang *et al.*) W.T. Wang, *stat. et comb. nov.* BASIONYM: *Batrachium jingpoense* G.Y. Chang *et al.*, Bull. Bot. Res. Harbin 12:241, fig. 1. 1992.

Batrachium jingpoense G.Y. Chang *et al.*, restricted to the northern Heilongjiang Province, is closely related to the northern temperate species *B. trichophyllum* (Chaix *ex* Villars) Bosche, differing from the latter in the smaller and tetramerous flowers with fewer stamens. A widespread species of the genus in China, *B. bungei* (Steud.) L. Liou, has a variety, var. *micranthum* W.T. Wang (Wang 1995), differing from the typical variety also in the small and often tetramerous flowers with fewer stamens. Thus, *B. jingpoense* may be better to be treated as a variety of *B. trichophyllum*.

Ranunculus L. sect. ***Stenoglossa*** (W.T. Wang) W.T. Wang, *stat. et comb. nov.* BASIONYM: *Ranunculus* L. subgen. *Stenoglossa* W.T. Wang, Bull. Bot. Res. Harbin 15:320. 1995.

This new combination is necessitated by the Flora of China Project limitation to a single supraspecific rank within each genus. Grouping the Chinese *Ranunculus* species into sections is more expeditious than use of subgenera.

Clematis minggangiana W.T. Wang, *spec. nov.* TYPE: CHINA. Central Yunnan (云南) : without field notes, 1939, *Ming-gang Li A2872* (HOLOTYPE: GH).

Liana lignosa. Ramuli atro-purpurei, sparse adpresseque puberuli, inconspicue canaliculati. Folia opposita, longe vel breviter petiolata, vel simplicia, laminis chartaceis cordato-ovatis 10.5-12.5 cm longis, 7.8-8.8 cm latis, basi cordatis apice acuminatis margine integris supra as costam et nervos laterales puberulis subtus puberulis, nervis basalibus 5 subtus prominentibus cum nervolis prominulis retem conspicuum formantibus, vel supera aliqua ternata, foliolo terminali distincte petilulato elliptico-ovato vel elliptico, 3-10.8 cm longo, 1.7-7.2 cm lato, basi subcordato rotundato vel late cuneato apice acuminato, foliolis lateralibus breviter petiolulatis vel subsessilibus eo terminali similibus sed minoribus 1.2-7.8 cm longis, 0.5-5.2 cm latis; petiolis 0.8-6.8 cm longis, dense puberulis. Cymae axillares, 1.6-6.5 cm diam., 3-25-florae; pedunculi 1.8-8.2 cm longi, dense puberuli; bracteae vel foliaceae, petiolatae, anguste ovatae vel ellipticae, 1.1-3.3 cm longae, 1-1.4 cm latae, vel lineares vel subulatae 2.5-8 mm longae, 0.3-2 mm latae; bracteolae subulatae, 1.5-5.5 mm longae; pedicelli 0.5-2.5 cm longi, densissime puberuli. Flos pendulus, campanulatus, 1.5-1.8 cm diam. Sepala 4, lutea purpureo-suffusa (?), lanceolato-linearia, 1-1.8 cm longa, 2.5-5 mm lata, apice recurva, extus tota facie intus superne

tantum sparse adpresseque puberula, margine dense velutina. Stamina sepalis subaequilonga, filamentis 8-14 mm longis dense villosis, antheris linearibus 4 mm longis glabris. Carpella dense villosa.

Affinis *C. henryi* Oliver, a qua foliis cordato-ovatis margine integris, cymis 3-35-floris, sepalis lanceolato-linearibus intus superne puberulis facile distinguitur.

This species is a new member of the sect. *Campanella* Tamura, and related to *Clematis henryi* Oliver, a species also with both simple and ternate leaves, differing from that species in the cordate-ovate entire leaves, 3-25-flowered cymes, and lanceolate-linear sepals, which are sparsely puberulous above inside. In *C. henryi*, the leaves are lanceolate and with denticulate margins, the cymes are usually 1-flowered, and the sepals are ovate or narrowly ovate and glabrous inside.

The new species is named after the collector, Ming-gang Li, who made important plant collections in central Yunnan Province, particularly in the Mt. Wuliangshan of the Jingdong County, in the thirties of this century.

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A NEW SPECIES OF *PINGUICULA* (LENTIBULARIACEAE) FROM MEXICO

H. Luhrs

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ABSTRACT

A new species of *Pinguicula* from México, ***P. gigantea***, is described and illustrated. It belongs in subgen. *Isoloba*, section *Agnata*, and is related to *P. agnata* Casper.

KEY WORDS: Lentibulariaceae, *Pinguicula*, Flora of México

After many recent publications of new *Pinguicula* species from México, in 1987 yet another species was collected in the state of Oaxaca by A. Lau. This species was later cultivated from seed, and examination of cultivated plants and habit photographs from the collector has necessitated the description of a new species.

PINGUICULA GIGANTEA Luhrs, *spec. nov.* (Figure 1). TYPE: MEXICO. Oaxaca: Steep slopes near San Bartolomé Ayautla, 500-800 m, coll. 1987, *A.B. Lau s.n.*; cult. Aug-Sep 1995 no. *9505* (HOLOTYPE: TEX!; Isotype: L!).

Herba perennis. Rhizoma simplex brevis, radicibus adventitiis numerosis filiformibus. Folia radicalia rosulata, plus minusve uniformia, semierecta, laete viridia, utrinque glandulosa, glandulis sessilibus et glandulis stipitatis dense vestita; "hiemalia" 6-9, oblongo-obovata, 35-60 mm longa, 24-38 mm lata; "aestivalia" 10-13, obovata vel oblongo-obovata, apice rotundata vel obtusa, margine non involuta vel parum revoluta, 60-145(-165) mm longa, 40-70(-80) mm lata, basi 6-9 mm crassa. Hibernacula nulla. Pedicelli 1-4(-5) erecti, pallide viridi, glandulis stipitatis dense obsiti, (105-)150-185 mm alti, uniflori. Flores 28-33 mm longi (calcari incluso). Calyx bilabiatus, extus et intus glandulis stipitatis dense obsitus; labium superum trilobum, lobis ovatis, 3-4 mm longis, 3-4 mm latis; labium inferum bilobum, lobis anguste ovatis vel ellipticus, 2.5-3.0 mm longis, 2 mm latis. Corolla subisoloba, pallide purpureo-violacea vel albido-lilacina (RHS purple-violet 82D), margine violacea, extus glandulis stipitatis disperse vestita; lobis subaequalibus,

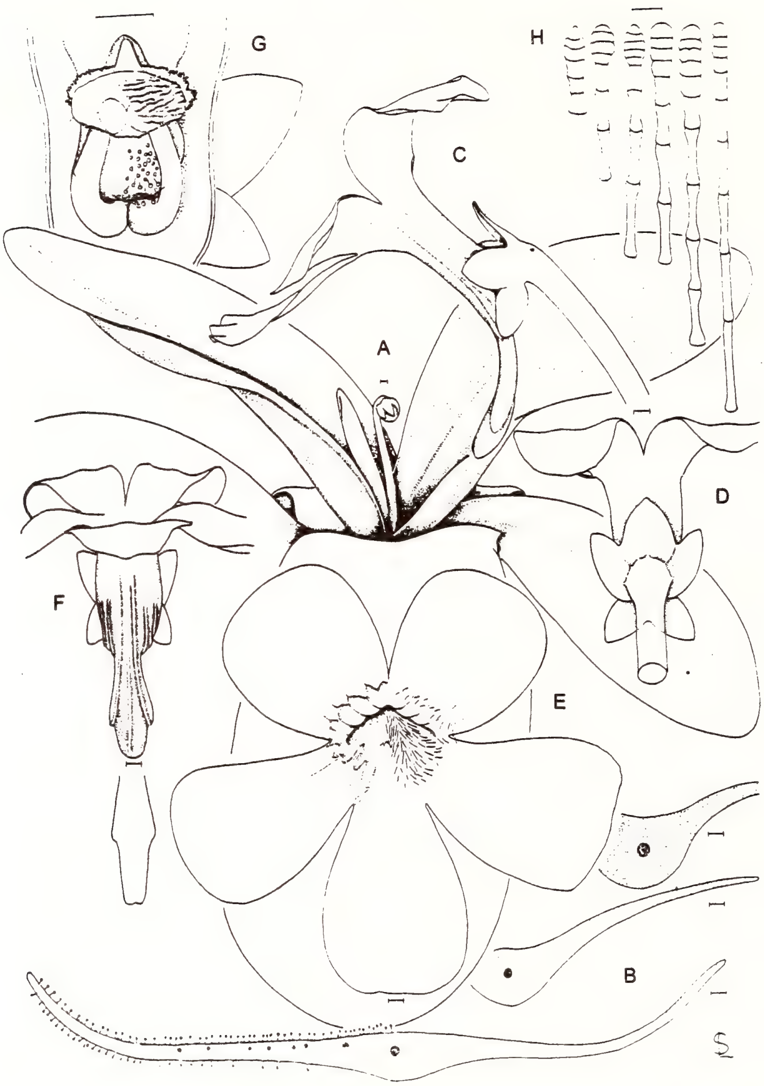

Figure 1. *Pinguicula gigantea.* A. habit; B. transverse sections of the leaf; C. flower, lateral view; D. calyx; E. corolla; F. corolla tube and spur; G. stigma, stamen, and ovary; H. hairs from right to left in pairs; lower petal, corolla tube entrance, tube interior. Scale bars A-G. 1 mm, H. 0.1 mm.

oblongo-obovatis vel subcuneatis, apice rotundatis vel obtusis, 10-13 mm longis, 5-9 mm latis, basi pilis longis cylindricis disperse vestitis. Tubus subcylindricus, laete viridis, basin versus leviter angustatus, violaceo-striatus, 9-11 mm longus, 4-5 mm latus, extus glandulis stipitatis disperse obsitus, intus pilosus, pilis longis cylindricis et pilis longis clavatis subcapitatis, sine palato. Calcar subcylindricum, obtusum, anguste angulato-ovatum, 5-8 mm longum, 1.5-2.0 mm latum, cum tubo angulum obtusum (130-140°) formans. Ovarium subglobosum, glandulis stipitatis parvulis obsitum. Stigma bilabiatum, album, labio infero superiorem superanti, suborbiculato, fimbriato. Capsula subglobosa ± 4 mm longa, glandulis stipitatis disperse obsita. Semina numerosa, scobiformia minutissima. Florescentia ± I -IV- (?)

Perennial herb. Stem short, with numerous adventitious fibrous roots. Leaves rosulate, more or less uniform, semi-erect, bright green on both sides, densely covered with sessile and stipitate glands; the winter leaves 6-9, oblong-obovate, 35-60 mm long, 24-38 mm wide; the summer leaves 10-13, obovate or oblong-obovate, apex rotundate or obtuse, margin not involute or lightly revolute, 60-145(-165) mm long, 40-70(-80) mm wide, 6-9 mm thick at the base. Hibernaculum absent. Scapes 1-4(-5), erect, pale green, densely stipitate glandular, (105-)150-185 mm tall, 1-flowered. Flowers 28-33 mm long (including the spur). Calyx bilabiate, both surfaces densely stipitate glandular; upper lip 3-lobed, the lobes ovate, 3-4 mm long, 3-4 mm wide; lower lip 2 lobed, the lobes narrowly ovate or elliptic, 2.5-3.0 mm long, 2 mm wide. Corolla subisolobate, pale purple-violet or whitish-lilac (RHS purple-violet 82D), margin violet, the outer surface dispersedly stipitate glandular; the lobes subequal, oblong-obovate or subcuneate, apex rotundate or obtuse, 10-13 mm long, 5-9 mm wide, dispersedly covered with long cylindrical hairs at the base. Tube subcylindrical, bright green, lightly narrowing towards the base, with fine linear violet markings, dispersedly stipitate glandular, 9-11 mm long, 4-5 mm wide, the inside covered with long cylindrical and clavate subcapitate hairs, palate absent. Spur subcylindrical, obtuse, narrowly angular-ovate, 5-8 mm long, 1.5-2.0 mm wide, forming an obtuse angle (130-140°) with the tube. Ovary subglobular, with very small stipitate glands. Stigma bilabiate, whitish, lower lip much larger than the upper lip, suborbiculate, margin fimbriate. Capsule subglobular, ca. 4 mm long, dispersedly stipitate glandular. Seeds numerous, minute. Flowering ± January-April-(?).

This species belongs to the section *Agnata*, characterized by uniform leaves, corollas with nearly equal lobes, a long cylindrical tube, the absence of a palate, and a cylindrical spur forming a distinct angle with the tube, being longer than wide. Within this section it is related to *Pinguicula agnata* of the subsect. *Agnata*, due to similar characteristics of the floral parts, but differs from this species by having somewhat smaller calyx lobes, a larger and pale purple-violet corolla, and a longer angular-ovate spur. One of the most characteristic features lies in the size of its leaves, and the fact that these are densely glandular on both surfaces. This peculiar property is known only in a few other species within the genus, but with tiny stipitate glands and rather sparsely scattered, mainly on the midrib on the lower surface of the leaf. The uniform

summer and winter leaves of *P. gigantea* differ mainly in size, and lacking a distinct winter rosette, whereas those of *P. agnata* are to a much lesser degree "uniform" (Casper 1966), forming an almost distinct winter rosette. Because of this, it does not conform totally to the features of the section *Agnata*, and it is possible that it belongs elsewhere. This will be discussed in a future revision of the Mexican species.

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